

NBP Benefits Report

7 February 2019

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Glossary of Terms

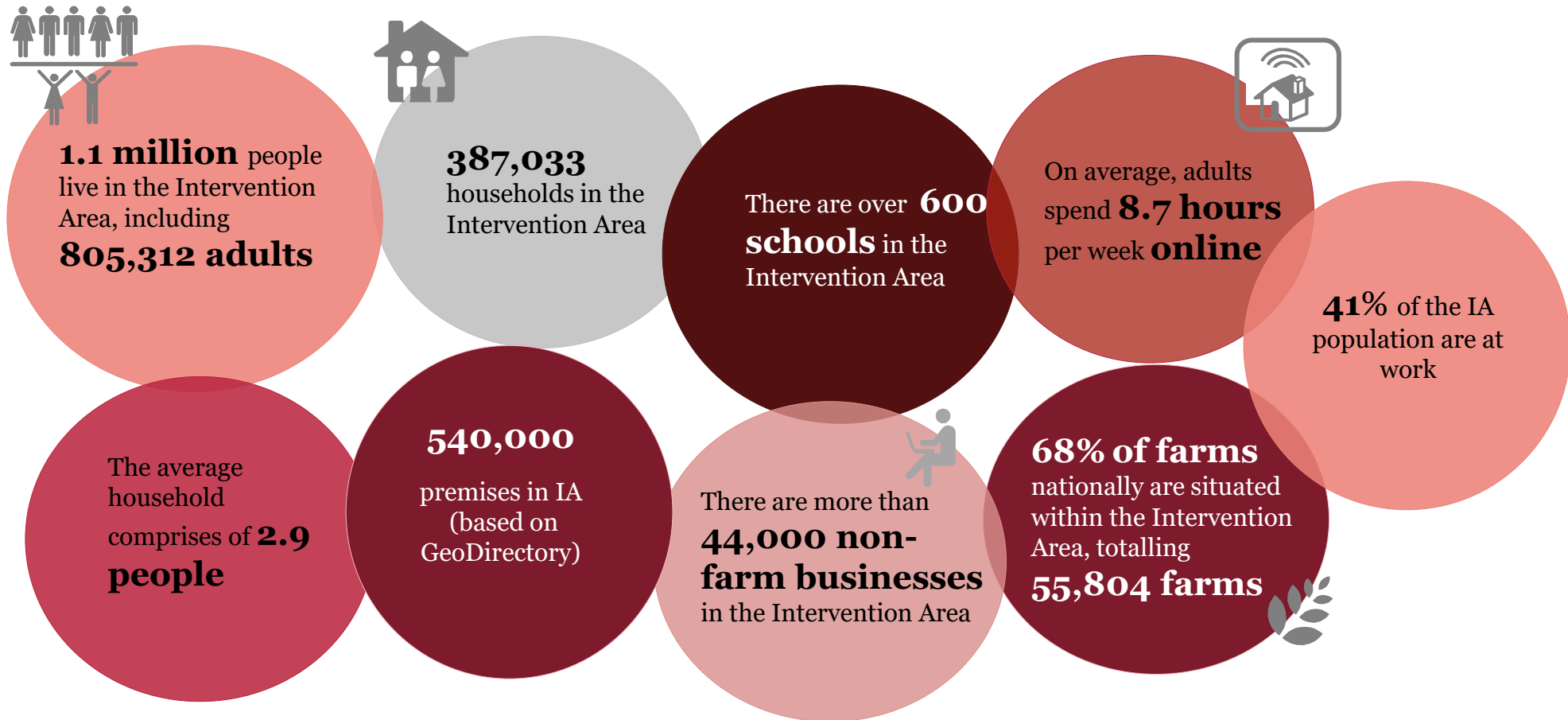
Table 1: Glossary of Terms

Term	Acronym	Description
Cost Benefit Analysis	CBA	An analysis of the costs and benefits which attach to a proposed investment.
Department of Communications, Climate Action and Energy	DCCAE	DCCAE was formerly known as the Department for Communications, Energy, and Natural Resources (DCENR).
Central Statistics Office	CSO	The national office for impartial collection, analysis and publication of statistics for Ireland
Fibre-to-the-Premises	FTTP	Fibre to the premises is a form of fibre-optic communication delivery, in which an optical fibre is run in an optical distribution network from the central office all the way to the premises occupied by the subscriber.
Intervention Area	IA	Those areas of the country where commercial operators have no medium term plans for investment and which are targeted for State led intervention.
National Broadband Plan	NBP	Government policy initiative to deliver NGA broadband services to all parts of Ireland, regardless of location.
Next Generation Access	NGA	NGA describes a significant upgrade to the Broadband available by making a step change in speed and quality of the service.
Organisation for Economic Co-operation and Development	OECD	An intergovernmental economic organisation with 36 member countries
Information & Communication Technology	ICT	Industry sector that captures technology and communications activity and businesses
Small or Medium Enterprise	SME	For the purposes of this study, the SME sector in the intervention area relates to home-based and micro-enterprises with average employment estimated to be at less than 3 FTE per enterprise.
Digital Subscriber Line	DSL	Digital subscriber line technology which enables much faster transmission than was traditionally the case with DSL.
Fixed Wireless Access	FWA	A type of internet access which uses radio signals instead of cable for service provider connection.
Multinational Company	MNC	Corporate organisations that own or control production of goods or services in 2 or more countries other than their home countries.

Introduction & Executive Summary

Demographic and socioeconomic statistics

Key demographic drivers and statistics, CSO & FTI analysis



Benefits of broadband access

"Finding ways to reach a wider audience is key to growing my business. Using Instagram and Facebook is vital. Customers want to see our clothes before they decide to visit my shops".

Ailish Mullane, Kimono Boutique in Charleville (in IA) and Newcastlewest (outside IA).

"The world has changed in the last number of years and buyers are now asking the question about the availability of broadband on our sites. It is causing an issue in the sale of some houses that do not have a reliable broadband service capacity"

Michael Kelleher, Operations Director, O'Flynn Construction

*Dr. Brian Carey lives in Bantry where his home broadband speed is 3MBPS. He added that rural Ireland is home to many people who support the economy by facilitating tourism and likened the necessity of the national roll out of broadband to the electrification of Ireland in the past, in that **"it is basic infrastructure to support rural life"**.*

"We would get no customers if we did not have broadband. Having a good website is also key to how we attract our customers".

Nora Egan, Inch House, Luxury Country House in Tipperary

"High speed broadband is key to where we locate our stores. We need reliable broadband for everything from ordering, banking, cardless transactions, backup activities or piling the music to the store."

Paul Rice, Musgraves

"We would have lost 50% of our business if we did not invest in broadband".

John Lambert • Kelly's Resort Hotel & Spa • Rosslare - Outside IA

"We use it for everything. I did a post-graduate last year and access to high speed broadband would have made accessing information easier. The less time I spend working or studying (with slow connectivity) would result in more time with the family"
Vet living in IA but working outside IA

"If customers had more reliable high speed broadband, we could sell more CCTV security systems and Smart RFID technologies. We are very constrained on our site here in Rockchapel as we do not have the bandwidth to set up a test site or have demonstrations which is obviously an issue for business growth".

Denise O'Callaghan, ADA Security Systems

Benefits of broadband access

"Farmers need access to broadband to drive growth and efficiencies in the business. The Department of Agriculture expect everything online so it is a necessity for operating farms today. Using technology is also vital for attracting young people back to farming"

Padraic Joyce, IFA

"I am a business & economic teacher and I use Google classroom to upload content and data for the student to review at home. We use the internet for research, viewing content online etc. All of these tools are invaluable tools in education today. Any student who does not have access to high speed broadband will be at a disadvantage".

James Sheeran, Teacher, Naas CBS

"We are 2 kilometres from Clifden and the broadband is not great. We need to be able to offer reliable Wi-Fi to attract our customers. Similarly 50% of my business comes through my website".

Francis Nee, Clifden Campsite & Caravan Site

"Access to high speed broadband in rural Ireland can transform education at primary, post-primary, third level and for those looking to return to education. This is key to creating sustainable communities for the long term"

Stjohn O'Connor, Dept. of Rural & Community Development

"Broadband access is crucial for businesses, such as Tusla, with workforces that are so geographically spread".

Fergal Collins, Tusla Child & Family Agency

"Access to broadband enables people with disabilities to live independently"

Siobhan Long, Enable Ireland.

"We got high speed fibre broadband to our business in Dromquinna Manor a few years ago and it has transformed the business"

John Brennan, Dromquinna Manor & Part Hotel, Kenmare

Executive Summary

This report was commissioned by the Department of Communications, Climate Action and Energy (DCCAE) in May 2018. This is an extension of the overall contract with the DCCAE that was signed in January 2015. It presents the findings on the qualitative benefits pertaining to the National Broadband Plan's roll out of Next Generation Access (NGA) broadband.

This plan, the need for which was referenced in the Programme for a Partnership Government (May 2016) and remains a priority objective of Government, aims to provide NGA broadband services to Irish households and businesses, located in areas which will not have access to commercial NGA services in the medium-term. These areas, referred to collectively as the NBP Intervention Area (IA), account for almost 23% (1.1m people) of our population. Additionally, the NBP IA is home to 55,804 farms and c. 44,000 businesses.

The Amber area in the map in Figure 1 depicts the Intervention Area. The map is updated each quarter to reflect the Commitment Agreement with eir, who will deliver high speed broadband to 300,000 premises in rural Ireland.

Source: DCCAE

The objective of this report is to outline any additional benefits deemed to be non-quantifiable that can complement the quantifiable benefits outlined in the CBA model. The CBA model was updated in August 2018 to reflect updated data and quantifiable benefits categories.

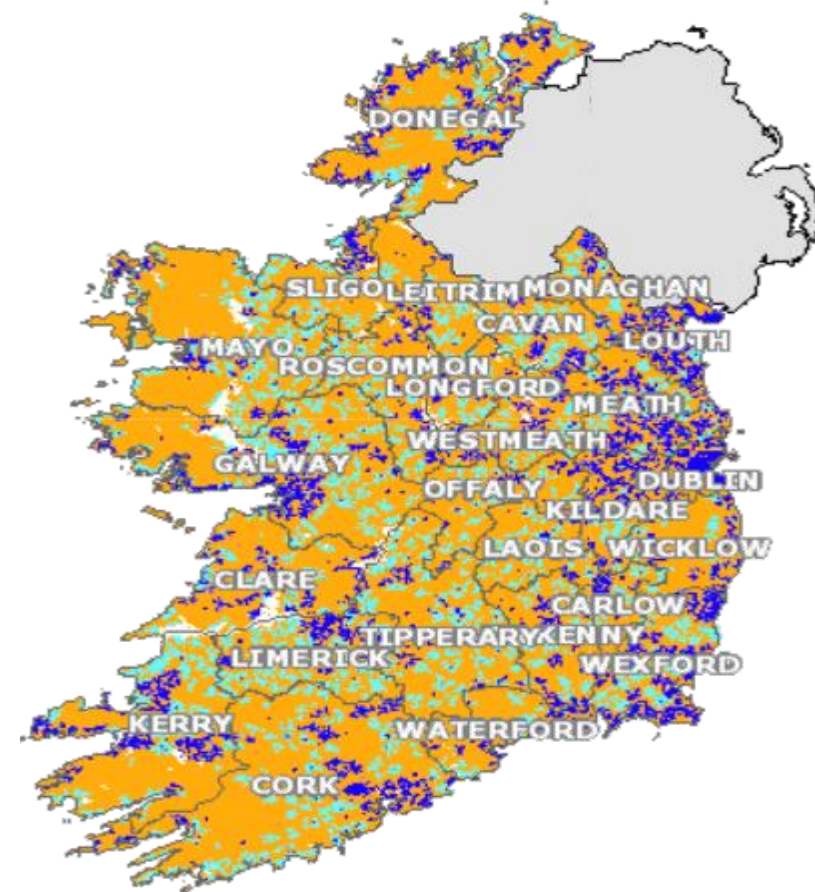
The approach and content of this report consists of:

- Desk-based research to support each of the qualitative benefits; and
- Interviews and case studies with individuals and businesses both inside and outside of the Intervention Area.

Ten areas were identified to capture these qualitative benefits which include: Agriculture; Education; Environment; Entrepreneurship, Enterprise & Jobs; Social Inclusion & Rural Development; Tourism; Transportation; Health; Entertainment; and Other.

Each of the benefits in this report complement the features of the CBA model and are supplementary to what is provided in the CBA report.

Fig 1: NBP Intervention Area (Amber), 2018



Executive Summary – Qualitative Benefit Categories

Agricultural benefits can be realised in the future by the adaptation of Smart farming methods. These methods can improve productivity, improve herd nutrition, allow for data-driven crop management, as well as reduce adverse environmental footprint.

Digital resources are becoming more part of the day-to-day education system. Using technology can benefit children in the school and at home but children will require access to broadband in the home to full avail of the resources now available.

Deployment of the National Broadband Plan has the potential to deliver a range of environmental benefits linked to Government Policy, Cloud services, as well as reduced emissions from teleworking & business travel.

Access to reliable broadband services can support net job creation through the growth of existing enterprises and the formation of start-ups in areas that previously did not have access to high speed broadband.

NBP NGA broadband can significantly contribute to rural development and social inclusion for all. Social media provides the ability to 'stay-in-touch' with people no matter the time-zone or geography. Other areas of benefit include security and access to online platforms, such as online banking and eGovernment tools.

Agriculture



Tourism



A lot of Ireland's great tourist attractions are situated within the IA and would benefit from having access to NGA broadband services. This will support the growth of SME businesses in promoting and attracting visitors from around Ireland and abroad.

Education



Health



Broadband will contribute to advances in technology and infrastructure which can increase efficiencies in making decisions across the healthcare landscape, as well as contribute to professional education and training in all healthcare settings; urban and rural.

Environment



Transportation



The roll out of NBP NGA broadband can help the transport system to evolve, and contribute to more effective traffic management, as well as uptake in electric vehicles, and eventually, automated, driverless vehicles.

Enterprise & Jobs



Other



The smart home experience of the future involves a smart hub as a central interface (e.g. amazon Alexa). This enables access to smart applications and out-of-home services. The smart home also holds enormous promise for persons with disabilities, improving quality of life and facilitating independent living.

Social Inclusion & Rural Development



Entertainment



Entertainment benefits relate to over-the-top content and gaming, which are becoming increasingly popular due to improvements in consoles and streaming platforms. Ireland has approximately 200,000 subscribers to Netflix, where every subscription can account for up to four users at any one time. Similarly bundling or unbundling of services will result in cost savings in the IA.

1. Education

Education

Introduction:

NGA broadband can provide a host of benefits to the education sector with the most significant being improvements in the quality and accessibility of education services for children. This is true in the primary, post-primary, tertiary and lifelong learning sectors. Improvements could include facilitating access to greater numbers of specialist teaching resources, through online tutorials, enabling online student project teams, online availability of educational tools to supplement the in-class learning experience, as well as enhancing the quality of face-to-face engagement with teaching staff.

Availability of NGA broadband in rural schools and homes also promotes early engagement with technology with potentially positive, long-term implications for quality and availability of ICT skills in Ireland.

Case Study:

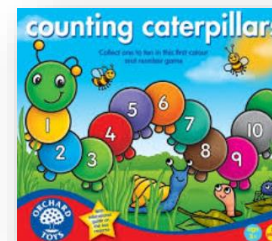
Background

- Lorraine was appointed principal to Lough Cútra National School in March 2018.
- No. of Students - 84
- Located in the Intervention Area

Examples

- Lorraine had come from a school which used ICT as an educational tool and she would have seen the benefits to students in using technologies to making learning easier, more fun and interactive. Since moving to her new school, she has introduced a number of education tools to the school which include: interactive whiteboards; touch screen; use of computers/iPads etc.
- “From looking up information, streaming songs, geography, problem solving - all of this makes teaching more effective”
- “Using technology can benefit the student both in school and at home. For example, there are lots of interesting maths apps out there, that a child can use to learn tables”. It teaches children to use games for educational purposes, not just for gaming and entertainment purposes”.
- “It is important that children have access to these resources at home, and broadband is obviously key to this”.

Interview with Principal, Lorraine Carth, of Lough Cútra Primary School (near Gort, Co. Galway)



“From looking up information, streaming songs, geography, problem solving - all of this makes teaching more effective”

Lorraine Carth, Principal

Education

Case Study:

Background

- Principal of a primary school in a rural area

Examples

- The 'Digital Strategy for Schools' underpins the ICT strategy for all schools going forward. The pillars include:
 - differentiated learnings for kids of differing abilities using app-based learning modules. Tailored learning apps have been developed but there are issues today where access slows down or falls over completely when a critical mass of students go online on their tablets at the same time.
 - enabling children to become independent learners which relies on widespread access to ICT both in the school and at home. Teachers should now be teaching children the skills to source content themselves rather than being prescriptive in their teaching methods i.e. teach them how to use google search rather than providing them with the search results
 - use of active whiteboards with touchscreen capability to provide an integrated learning experience, however, this is very dependent on access to high speed broadband

Interview with a primary school Principal based in rural Ireland

Interactive white board for illustrative purposes only



“Use of active whiteboards with touchscreen capabilities provides integrated learning experiences, however, they are ‘very dependent on access to high speed broadband’.

Primary school principal in rural Ireland

Quote...

“We lost a lot of days to Storm Emma earlier in the year but any of the students who had access to high speed broadband were able to work from home to catch up during this period.”
- James Sheeran, teacher in CBS Naas

“Before we had high speed broadband everything was slower, you were waiting for that moment when the internet would time out. We use it as a teaching tool now so it's great to have high speed broadband. You can incorporate it into your classes. –
Martin Devine, Eureka School, Meath

2. Agriculture & Farming

Farming – Benefits of High Speed Connectivity

Introduction

The NBP can provide many benefits to the agricultural sector in Ireland by supporting improved productivity and farm utilisation, as well as reducing costs through more efficient herd management. Farmers need to ensure they meet the ever increasing regulatory compliance requirements which add a significant administrative burden. More and more of these tasks can be carried out online and access to high speed broadband can reduce the time spent and allow farmers to focus more time on farm management.



Reduced administration burden

- Farm administrative functions are increasingly carried out by means of online submission and database tracking systems.
- The labour and administrative cost of monitoring produce output; livestock registration, updating medical records, and breeding cycle data are greatly reduced with automated tracking and reporting systems.



Reduced waste footprint

- Dynamic nutrient management can be applied to fertiliser application to maintain optimal levels, avoiding harmful environmental impacts of excess nutrient levels and driving full technical capacity from the land.
- Key input costs (e.g. fertiliser cost) are minimised through optimal nutrient management.



Improved herd nutrition and health

- Centrally managed, enhanced data records automatically update on-farm feeding systems to alter plans and rations, ensuring tailored nutrition plans for livestock.
- Remote medical herd monitoring ensures more timely and effective veterinary intervention improving herd health.
- ICBF plays a key role in measuring the genetic merit of the national herd and thus data is central to this work.



Data driven crop management

- Input variables and crop management decisions informed by detailed data collating technology increases yields across farms.
- Tailored software programmes that update variables from weather forecasts to market commodity prices drive efficient farm management and profitability.

Increased output

By driving farm utilisation towards its technical capacity output, it can help to improve farm revenue. Improved herd health and feed management drives productivity. Furthermore, farm managers can be assisted through specialist online software programmes which focus on and optimise total farm profitability. Improved genetic profile through data collection is key to maximising the commercial value.

Reduced cost

Optimal input application, efficient herd management along with instant online administration and reporting greatly reduces the labour cost of farm management.

Increased regulatory compliance

Timely and more accurate farm paperwork submission increases compliance with Dept. of Agriculture, Irish Cattle Breeding Federation (“ICBF”) regulation and adheres to reduced environmental impact requirements of the GLAS (Green, Low-Carbon, Agri-Environment Scheme).

Farming

“Smart” farming is in early stages of development but early indicators are positive

For the dairy co-ops, engagement with suppliers is a key activity. Historically, the communications have relied on paper and postage, however this is evolving towards electronic methods. Some co-ops are investing time to facilitate a future where all communications can be online and are trialling methods, such as a members private portal for the suppliers. Farmers are being actively encouraged to use the internet with plans that such portals will be available on smart phones and tablet devices.

Dairy farmers have a reputation for adapting new technology. Researchers predict that 20% of cows across the EU will be milked by robots by 2020. Up to 50% of new milking machines that are being installed in other countries in Europe are the automatic milking robots.

Smart Farming is a programme led by the IFA and works with the knowledge and expertise of Teagasc, EPA, UCD, SEAI, FTMTA, Fertiliser Association of Ireland, Irish Grassland Association, and the National Federation of Group Water Schemes. The programme was launched in 2016 with the objective of identifying savings of €5,000 and having an average greenhouse gas emissions reduction of 5-7% by farm. In a progress report published in 2017, Smart Farming over-delivered on these objectives:

Initial indication from Smart Farming is that there is an overall cost improvement of an average of €8,700 and greenhouse gas emissions reduction of 10% per participating farm.

SMART Farming focuses on the following areas:



While Ireland is in the early stages of adapting Smart Farming, there is limited data available. In Australia there has been some initial studies on research farms. Work on a demonstration farm (The Kirby Farm) focusing on wool and beef cattle is measuring how digital services can help to deploy resources more efficiently on the farm. Further research is required on the Kirby Farm, but initial results suggest overall improvement ranging from 30% to 50% in the following areas:

- | | |
|---|-----------|
| • Benefit of improved soil fertility | 13% - 26% |
| • Benefit of improved feed allocation | 9% - 11% |
| • Benefit of animal production monitoring | 4% - 9% |
| • Benefit of animal health monitoring | 4% - 13% |

Having high speed broadband is important to achieving the benefits of Smart Farming

- ICT is key to the delivery of Smart Farming, with a lot of new developments over the last number of years. Dr Peter Mooney, a Lecturer in Department of Computer Science at Maynooth University, is an expert in this area. In his view, there are significant cost savings for farmers in investing in “smart farming”.
- “From email alerts that a heifer has drifted from the herd, or that a calf is struggling with an abnormal cough in the middle of the night, to driverless tractors applying manure in a specific way”.
- "A smart farm is about getting more value out of the resources through information technology, mobile phones, apps and the internet. The open-source element is about using software to share, modify and exchange this data with others“.
- “Farms generate vast quantities of rich and varied data every day. A large portion is not utilised. Even the OCED indicated that 80% of data generated by farmers is not used productively. If stored correctly, this data can be used as digital evidence to reduce time spent completing grant applications or carrying out farm inspections, saving on average €5,500 per farm, per year“.
- “Introducing aerial survey drones to map weeds, yield and soil variation could increase wheat yields by 2-5pc. Using a fleet of specialised agri-robots, or 'agribots', capable of microdot fertiliser application could dramatically reduce fertiliser costs. Monitoring animal health and well-being through sensors could increase herd survival and milk yields by 10pc. GPS-controlled smart tractors have the potential to reduce soil erosion and could save fuel costs by 10pc”.
- "Smart tractors can move around a field to avoid puddles and survey drones, and mini robots move up and down a field making soil samples“.
- “High-speed broadband will need to be in place in order to avail of the technologies and the benefits of implementing smart farming”.
- Precision Livestock Farming (PLF) offers a range of technologies to continuously monitor farm animals and their immediate environment. These technologies have the potential to help farmers make decisions that will result in increased profitability, animal welfare and reduced impact on the planet.

- Interview with Dr Peter Mooney, a Lecturer in Department of Computer Science at Maynooth University



Farming – Case Study 1

Document management and administration

Regulatory and oversight requirements of traceability, milk/meat quality and animal welfare imposed by the EU, Bord Bia, the Department of Agriculture along with beef factories and dairy co-ops mean that there is an increasing requirement for timely and accurate documentation of medical and other herd records. Many of these records are required to be stored for up to five years to ensure ongoing compliance.

Many new commercial applications such as 'Herd Watch' can be utilised to ensure an instant monitoring system and can be adopted and instantly submitted to national databases without the need for time-consuming paper-based administration. It is estimated that tracking systems involving these sensors can save approximately four hours per week of administration time for minimal technology investment cost (€69 per year).

The substantial reduction in administration time means that time can be allocated to more productive activity. It further means that farmers can self-submit output data under requirements for the single farm payment scheme.

ICBF is focused on developing the genetic merit of the national herd. There is a focus on the Economic Breeding Index (EBI) and work on selection for genetic performance. Hence, superior genetics is a key driver to financial return for the farmer. Better genetics leads to healthier animals that are more productive with increased output and performance. In supporting ICBF with its mission, farmers have a strong engagement in the collection of data.

The Farm Carbon Navigator was developed by Teagasc and Bord Bia as an advisory tool to support the Sustainable Dairy Assurance Scheme. The Dairy Carbon Navigator focuses on the 5 win-win efficiency measures:

- Increased EBI
- Longer grazing season
- Improved nitrogen use efficiency
- Improved slurry management
- Energy efficiency



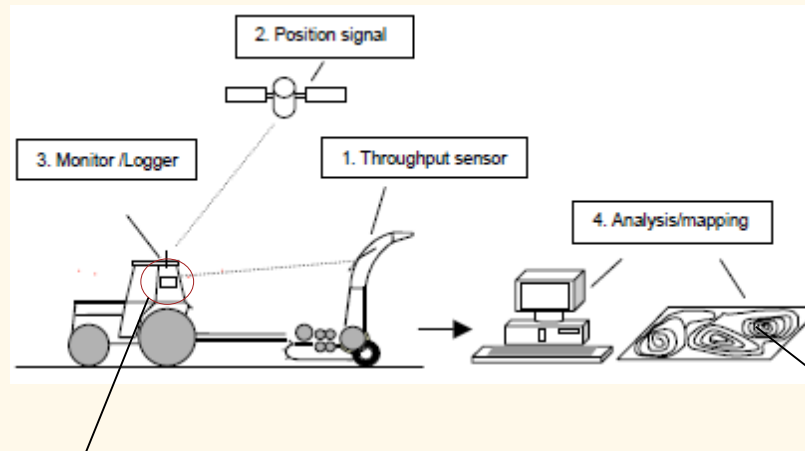
Farming – Case Study 2

Crop management and yield optimisation

Crop management

Crop management systems are increasingly based on automated mapping systems which connect historical output data with GPS monitors and mapping tools to optimise future crop yields.

These systems are collated through a central online database which allows for the effective remote monitoring of crops.



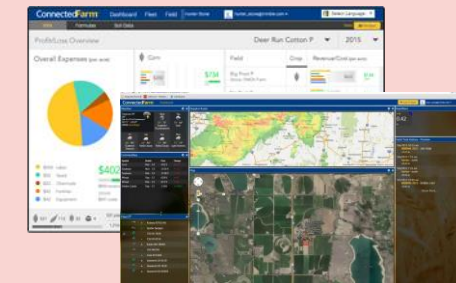
Live operational Dashboards

- One such commercial example of this is the 'Connected Farm Dashboard' by Trimble. This technology allows for factors such as field tasks, irrigation monitoring, vegetation health and dynamic commodity prices to be factored into farm management decisions.
- These dashboards allow farmers to get snapshot views of relevant live operations data. For example, if the farmer is viewing yesterday's planting activities, the dashboard may show population, simulation, skips and doubles. Farmers daily decision making is therefore aided by a data driven insight.



Farm management

- With a decline in relative Irish Labour participation in agriculture from 25% in 1973 to 8.5% in 2017, operational monitoring tools and larger farm remote monitoring software applications are becoming essential to effective farm management.
- Farmers can now monitor multiple sites and effectively organise workers to achieve greater efficiency, higher output and reduced costs.



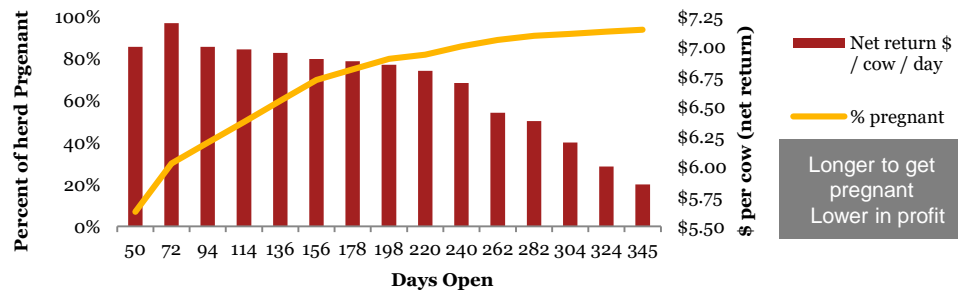
Farming – Case Study 3

Technology and Herd Management

Sensors

Herd management can be optimised by using sensors connected to cloud-based data systems which can have a number of cost savings and efficiency gains. Monitoring systems, which influence reproduction cycles, help to ensure that cows are pregnant at optimal times, maximising the economic value from the cow. Farmers can therefore intervene appropriately to maintain a healthy and productive herd. The benefit of timing reproductive cycles is substantial in terms of improved profit return per cow (as detailed below).

Reproduction vs. Profit



Use of robotic milking machines replace traditional practice of time-bound milking with a system where the cows voluntarily go to a robotic mechanism to be milked. The decision of the cow to go to the robot is linked to the “grass allocation method” with the cow moving voluntarily to a fresh pasture. The robot can milk circa 70 cows over a 24 hour period, with only 1 cow milked at a time. These systems collate and manage output data which helps to streamline management of the milking process, which greatly increases the efficiency of the farm. A chip embedded in the cows leg can monitor milk yield per cow and can quickly identify any variations and thus see problems and take corrective action. Similarly, a sensor on a tail can indicate when calving is imminent.

Scientific studies estimate that missed heats through illness can cost €250 + per animal.



Farmers can manage their herd database from smartphones, indicating when an animal is in heat, pregnant, feeding, ruminating or resting.



Leg-based sensors can indicate when corrective action or medical intervention is required. Moocall Calving Sensor, which records tail-movement patterns and spinal contractions that point to the cow going into labour. The ability to keep a record in order to determine future trends can be helpful.



Smart Farming

Aidan & Anne Power
Dairy Farmers in Garrane, Latteragh, Co. Tipperary
3 daughters (Age 11 to 21)



- Aidan and Anne Power are currently milking 120 cows on a dairy farm that consists of a total of 115 acres. In 2012, the Power's installed two robotic milking machines on the farm. Since this installation, there have been some notable changes and improvements on the farm, particularly in the way the farm manages its grass, and substantial increases in both cow milk yield volume and milk solids yield. These improvements have resulted in a corresponding increase in profits. The automated system has the capacity to reduce labour requirements by a third, saving the dairy farmer up to 3.5 hours daily and in the case of the Powers, this has been the real long term benefit.
- The Powers use 3G to read data, which is expensive as they live in an area that does not have reliable high speed broadband. All of the information is stored remotely by the suppliers of the robotics and data management systems with summary reports issued to the Powers.
- "The additional technology in the robotic equipment has allowed the cows to meet their genetic potential".
- "It takes a long time to upload or download large data set and it is quicker for me to travel to the local office of the suppliers and get the data. There are a number of additional modules of the robots that I would avail of that would benefit the production and efficiencies of farm management if we had high speed broadband".
- "There are lots of other technologies that we would use on the farm but we are constrained by the broadband i.e. sensors, drones etc".

- Interview with Aidan Power

Farming

Some thoughts.....

"I have a number of cameras on my property that provide great security. This is a real time saving as I live 1 mile from the yard, so it saves me driving up and down to check on things. It is also really helpful during the calving season "

Glanbia Supplier

"Smart Farming is about improving efficiency of farms to increase farm income but also to improve the environment"

Dairy farmer in Longford

"I milk 120 cows and in May 2012 I installed the robot. Now I can monitor all farm activity from the farm office. The technology is great, the data will identify if a cow has a problem, relying on data is so much better and more timely than the naked eye. In terms of labour, the robot saves me 24 hours a week."

Aidan Power, farmer in Tipperary

"Monitoring animal health and well- being through sensors could increase herd survival and milk yields by 10pc. GPS-controlled smart tractors have the potential to reduce soil erosion and could save fuel costs by 10pc"

Dr Peter Mooney, Maynooth

"Using data management system has saved me hours on paperwork "
Farmer in Offaly

3. *Environment*

Environmental Benefits

Introduction:

Deployment of the National Broadband Plan has the potential to deliver a range of environmental benefits. Broadly speaking, environmental benefits can be expected to take many forms including Government Policy, Teleworking & Business Travel; Cloud Services; Smart Homes; Smart/Precision Agriculture; and De-materialisation.

1. Government Policy

The NBP's creation of environmental benefits also contributes towards Government engagement across a range of national and EU policy agendas:

Climate & Energy

- Climate Action and Low Carbon Development Act 2015
- National Mitigation Plan
- EU2020 Climate & Energy Package
- EU2030 Climate & Energy Framework

Sustainability

- The UN Sustainable Development Goals
- EU 2018 Circular Economy Package

Environment

- EU Nitrates & Water Quality Directives

2. Smart Homes

PwC identify that delivering higher energy efficiency standards within both Ireland's existing and future building stock is critical to driving emissions reductions in the residential sector. Enabling increased consumer engagement and management of domestic energy consumption will play an important contributory role in decarbonising the residential sector. As homes and consumer products become progressively more connected or smart, consumers are increasingly turning to smart heating, metering and lighting systems. The ability to remotely manage one's domestic energy consumption, coupled with enhanced energy data within the home, provides consumers with greater autonomy over their energy consumption. However, access to a reliable, high-quality superfast broadband connection is integral to a home's ability to become connected and smart.

Source: PwC Analysis

1. Irish Times, 'Electric Cars about to become the 'new normal' in Ireland', Wed April 18, 2018

Environmental Benefits

3. Teleworking & Business Travel

With teleworking or working from home generally recognised as an important driver for reducing commuter transport energy use and carbon emissions, the ability of workers to access reliable high-quality broadband is central to encouraging increased teleworking and thus reducing the emissions associated with daily commuting. The deployment of FTTP in rural Northern Ireland is expected to see almost a thousand more workers working from home as a result of new broadband connectivity¹. It is anticipated that this will deliver approximately 500 tonnes of CO₂ abatement per annum, totalling 6160 tonnes by 2033. An examination of the environmental policy implications of working from home in Ireland identified that, on average, at least an average net saving of 9.33 kW h per day can be achieved where an individual converts to working from home.

The ability to access high quality broadband can reduce the need for business travel, thus reducing the carbon emissions associated with a company's travel footprint. The availability of facilities for business employees to participate in video conferencing (with clients or colleagues), utilise online collaboration tools or to simply share large files diminishes the need for face-to-face meetings or site visits. The UK Broadband Impact Report (2013) estimated that faster broadband will reduce the UK's business travel distance by 5.3 billion kilometres by 2024; representing a significant reduction in transport associated emissions.

4. Cloud Services

Cloud computing impacts will materialise through an evolving reduction in energy consumption as the ability to access cloud storage based services become more viable. The ability to replace on-site privately hosted/owned computing services (in either the home or the work place) with cloud-based services offers the potential to realise carbon and energy reduction benefits. The Superfast *[Broadband]* Cornwall Evaluation (2015) describes that as the infrastructure used to deliver cloud-based services is shared amongst multiple users, it can deliver enhanced energy and carbon efficiencies relative to traditional private owned infrastructure. The UK Broadband Impact Report (2013) identified that 1 billion kWh of electricity use will be avoided, per annum, as a result of broadband-using enterprises shifting server capacity onto public cloud platforms by 2024. This cloud service switch would reduce annual CO₂ emissions by 0.24 million tonnes per annum by 2024.

Source: PwC Analysis

1. DotEcon, 2018, Deployment of FTTP in rural Northern Ireland. A DotEcon report for NI Networks, part of BT. DotEcon Ltd

Note: in identifying emissions reductions associated with teleworking, it is important to acknowledge the potential existing of 'rebound' effects; e.g. increased demand for domestic heating due to home working, new shopping or school run journeys associated with home working.

Environmental Benefits

5. SmartGrid

A long-term positive effect of high speed broadband for all is how it all integrates with other EU wide initiatives such as SmartGrids. The European Technology Platform (ETP) SmartGrids, which is supported by the European Commission, defines Smart Grids as electricity networks that can intelligently integrate the behaviour and actions of all users connected to it - generators, consumers and those that do both – in order to efficiently deliver sustainable, economic and secure electricity supplies. SmartGrid will facilitate a more efficient electricity system which will give power to the consumer to use electricity in their homes and businesses in a way that is most efficient for them and integrate with how they live and work. This will in turn reduce carbon emissions associated with the electricity they use. It is anticipated by the ETP that the Smart Grid can reduce the overall environmental effects of electricity supply, e.g. it can contribute to reduced fossil fuel consumption and therefore indirect long term positive impacts on air quality, climate and human health.

<http://www.smartgrids.eu/ETPSmartGrids> National Broadband Plan Intervention Strategy – SEA Environmental Report

4. Enterprise, Entrepreneurship & Jobs

Enterprise & Jobs Benefits

Introduction:

It is clear that the NBP will support net job creation in Ireland, both directly and indirectly, while also helping existing businesses across the Intervention Area to increase productivity, access new customers and markets and support workers who are based in the IA but currently have to commute to non-intervention areas for work.

The annual Action Plan for Jobs (currently 2018 edition) continues to emphasise the importance of balanced regional development. It has set a target rate of unemployment in each region that should be no more than 1% higher than the national average by 2020. It highlights the need to invest in infrastructure including having access to high speed broadband in rural areas in order to create a dynamic and innovative economy and increased net job creation.

Net Job Creation:

The NBP will support net job creation nationally in the short-term in the following ways:

- 01** Improve the financial performance of existing businesses in sectors such as tourism, agriculture and other international trading in the IA, with positive implication for their ability to grow
- 02** Enable the establishment of new start ups in the IA, which would previously have been constrained by a lack of access to NGA broadband services
- 03** Improve productivity of employees living in the IA and working for MNCs and other non-IA employers by enabling feasible out-of-hours working
- 04** Expand the talent pool available to non-IA employers, through the facilitation of remote working arrangements, particularly in sectors where there are key skills gaps constraints
- 05** Improved financial performance of larger businesses which depend on IA enterprises for their supply chain with positive implications for employment



There are approximately
146,739 white collar workers
living in the
Intervention Area



Enterprise Profile in the IA

NBP Intervention Area (Amber), 2018

There are approx.
100,000 businesses
in the Intervention Area

Non-farm enterprises are
dominated by **SMEs**

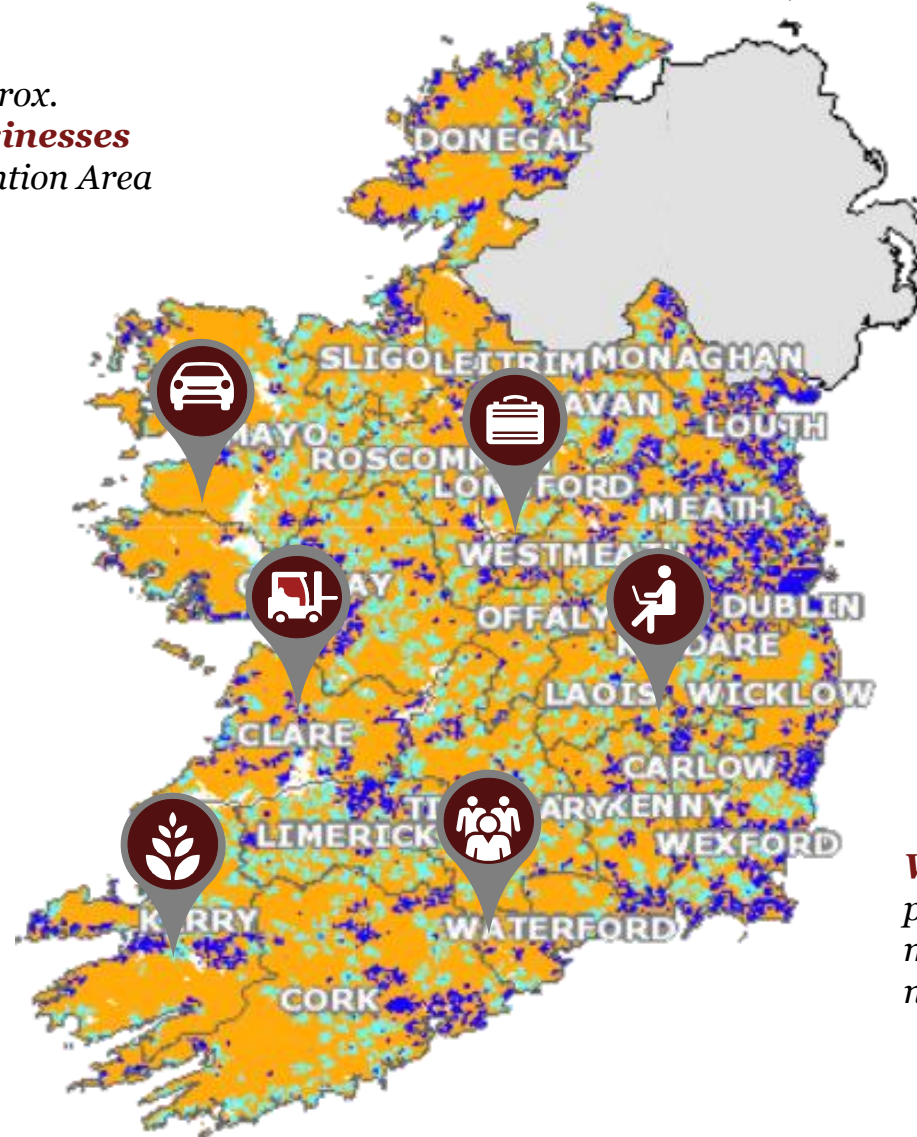
Average number of
staff per enterprise is
less than 3

More than half of these
enterprises are accounted
for by **farms (56,000)**

The majority of the **white
collar workers** who live
in the IA **travel outside
of the IA** to work

**68% of total farms in
Ireland** are situated in
the Intervention Area

White collar worker
prevalence is only
marginally below the
national average



Enterprise, Entrepreneurship & Jobs Benefits

Case Study 1 – Ludgate


The Ludgate hub opened in Skibbereen in 2016, offering 1GB of superfast connectivity in modern office facilities for new and growing enterprises. Prior to opening, businesses in the local area had limited access to internet services which impacted productivity and the potential to expand.


Now, businesses located in the hub are experiencing significant growth while new start-up businesses are benefiting from the collaborative and creative work environment that the hub provides. The growth of the hub is creating a positive knock on effect on the local community with more people relocating to the area and enabling local people who work in Cork to now work remotely thanks to reliable broadband access for the whole community.



Ludgate in Numbers

 **240** direct and indirect jobs created in two years since opening

 **15%** productivity gain identified by a furniture business

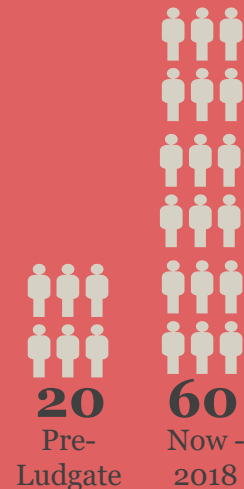
 **€11.3m** estimated economic impact of Ludgate for Skibbereen in 2016

Skibbereen is now a “digital community creating jobs and creating innovation”

Sean O’Driscoll, Co-founder of Ludgate Hub

Spearline Labs, a technology business specialising in testing toll and toll-free numbers, was established in 2003.

While always based in Skibbereen, Spearline has grown from 20 to 60 people since moving into Ludgate and gaining access to reliable high speed broadband.



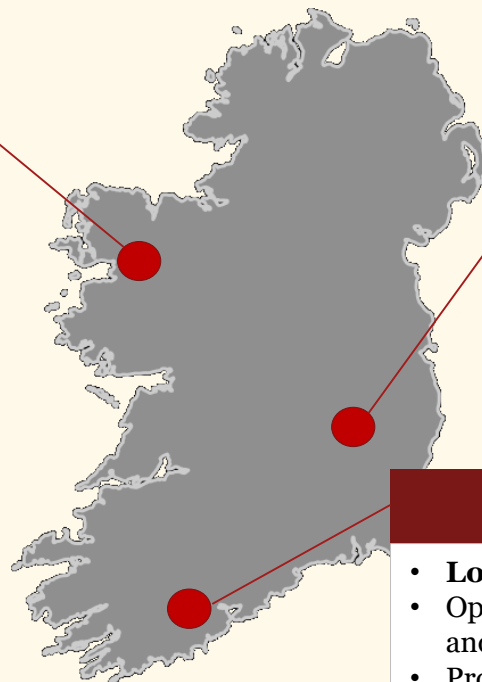
Enterprise, Entrepreneurship & Jobs Benefits

Case Study 2 – Other Digital Hubs

The lack of reliable fast broadband in rural Ireland has led to a number of ‘digital hubs’ being established in towns around the country. While still in the early days, the hubs and access to reliable fast broadband is leading to expansion of existing enterprises as well as job creation through new start-ups that previously did not have access to the broadband and extended services now available in these hubs.

The Leeson Enterprise Centre

- **Location:** Westport, Co. Mayo
- Opened in the summer of 2017, an innovation hub designed to help local entrepreneurs and start-ups in Mayo succeed.
- Facilities include hot desks, co-working and private office space, and meeting room facilities.
- With access to 1Gb connectivity, the centre is at 85% occupancy. Approximately thirty people in nine businesses operate out of the centre and availing of the reliable broadband services available to them.



Enterprise House

- **Location:** Carlow, Co. Carlow
- A one-stop location for start ups and developing enterprises where entrepreneurs with ideas can leverage a wealth of experience and support.
- Provides 1Gb connectivity to 20 businesses and 93 people on location.

Brookpark Business Centre

- **Location:** Dunmanway, Co. Cork
- Opened in May 2018 with the objective of creating enterprise and employment in Dunmanway and the surrounding area.
- Provides 1GB broadband connectivity along with conferencing, training, board room, office space and hot desk facilities.
- Part of Brookpark Community Enterprise Centre which includes 3 x Start Up units.

Enterprise, Entrepreneurship & Jobs Benefits

Relocating Case Study – David Keane & Caroline Leonard

West Cork natives, David Keane (Ludgate member) and Caroline Leonard spent over 11 years in London establishing their careers, and moved back home to Skibbereen with their young family in late 2017. David is a Senior Patent Attorney with an international firm of Patent and Trademark attorneys. On moving back to Skibbereen, David became a Ludgate member where the 1Gb connectivity and professional environment has helped to make David's move from the City of London to Skibbereen as seamless as possible. As a patent attorney, David works with entrepreneurs and start-ups on a daily basis and therefore, he feels right at home working in a entrepreneurial ecosystem such as Ludgate. Caroline took her extensive marketing experience gained in London and is now the Marketing Manager for Spearline Risk & Compliance, a start-up that began its life in the Ludgate Hub in late 2017. The company has since outgrown Ludgate and has moved on to its own premises within Skibbereen in order to accommodate its expanding workforce of 12.

"We are delighted to be working in Skibbereen. We grew up in this area and it is great that our children can experience the same close-knit, family-oriented upbringing that we enjoyed as children. The Ludgate Hub has helped us to keep our careers on track and to improve our quality of life"

David Keane & Caroline Leonard

Teleworking Case Study – Lucy Murphy & James Draper

"Without the proper broadband infrastructure in place, our work simply wouldn't be possible in a small rural town. Ludgate has provided us both with a great opportunity to work while enjoying the beautiful surrounds of our home town"

James Draper, Skibbereen resident

Lucy Murphy of Granite Digital and James Draper of Teamwork both previously worked in Cork city. They have now returned to West Cork with their young daughter, having been facilitated by their employers to work remotely thanks to 1Gb connectivity in Skibbereen. James says that this was fundamental in allowing them to make the move. Each of their employers are strong advocates for remote working and strongly encourage their employees to choose where to work from. This is because the businesses have seen first-hand the advantages that are generated from such a policy.

Enterprise, Entrepreneurship & Jobs Benefits - Teleworking

Telework provides key benefits, such as:

- Improved employee retention
- Offers individuals a better work-life balance
- Wider pool of applicants available to employers
- Productivity gains
- Cost savings (office space, power consumption, insurance etc.)
- Reduced costs for employees i.e. day-care, car insurance, clothes, food, fuel etc.
- High impact on employee satisfaction levels
- Reduction in unscheduled absences
- Fewer work-related illnesses
- Ability for companies to locate sales staff near clients, rather than in their premises
- Reduce road travel thereby reducing congestion & strain on transportation infrastructure
- Reduced fuel consumption & reduced greenhouse gases
- Increased employment opportunities in regional locations which may lack employers of scale.



Benefits for society

- Telework supports a spatial strategy policy and allows people the possibility to live further away from their employer. Hence, this provides a positive benefit for rural communities as people can live in such communities and contribute to both the local rural economy and also participate in community-based activities. Thus telework affords people the opportunity to spend more time in the local area instead of enduring long commuter journeys to their place of employment.
- NGA also has an effect of spreading employment beyond the cities.
- The avoided travel time and journey time has a positive impact on the environment with a reduction in Carbon Emissions. However, some of these benefits may be offset in higher energy costs in heating the home office or high data traffic and connectivity with the cloud and data storage.
- Another positive on transport is the potential for a reduction in “Road Congestion” in urban areas due to less commuters using cars.

Enterprise, Entrepreneurship & Jobs Benefits - Teleworking

Also positive for the employee

- The employee is motivated by the prospect of “telework” as it affords them a greater level of flexibility. This allows staff the scope to do chores such as the school pick-up / drop-off, log on at off peak times, as well as the flexibility to take video calls in out of hours, and connect with colleagues in different time zones.
- Staff have the positive health impact of less commuting and are relieved of the stress of dealing with traffic congestion.
- Research shows that staff who telework are more productive as they experience fewer interruptions. The literature states that 26 hours telework is equivalent to 40 hours in the office environment.
- The ultimate result is a more motivated staff member. This translates into a reduction in the level of staff churn. Research indicates that staff retention improves by nearly 50%. This is also positive for the employer as the loss of knowledge and experience reduces and the cost of training new staff is avoided.

Benefits for business

- Telework reduces the overhead costs for companies. As employees increasingly telework, there will be a reduction in the size of the physical structures necessary to support the workforce. Thus as employees work remotely, the concept of the bank of “hot desks” will displace the traditional model of dedicated desk spaces.
- This evolution will allow businesses better plan their infrastructure needs as the physical office footprint will shrink. Hence, companies who embrace the “telework concept” will become more competitive as they reduce their cost base.
- In addition to lower costs, those employees who telework are proven to be more productive which also contributes towards a gain in competitiveness.
- It is evident in the Amazon case study (outlined below) how telework will be a complementary model to that of the physical call centre which is office based.
- Companies where telework is permitted are shown to reduce absenteeism by 22%

Enterprise, Entrepreneurship & Jobs Benefits - Teleworking

Half-time telecommuters gain back 11 days a year - time they would otherwise spend commuting

IDA Ireland has identified internet connectivity as a key policy parameter for jobs and enterprise. A minimum of 30Mbps download speed is a minimum for telework

“Home working offers an opportunity to provide an additional source of untapped skills for our client companies as well as providing regional employment opportunities in locations which find it challenging to attract investment.”

- Martin Shanahan, CEO IDA Ireland

Employers can save over €11,000 per half-time telecommuter per year. Across the work at home population in the US, that potentially adds up to €44bn in savings

Telecommuters in the US reduce greenhouse gas emission by the equivalent of taking over 600,000 cars off the road a year

Aetna, an insurance giant in US, shed 2.7 million square feet of office space and as a result saved \$78 million. American Express report similar results from telecommuting

“Of employees who are offered flexible working hours, 82 per cent said it made them feel more positive about their job while 79 per cent said it was a reason to stay with their current employer for longer”. Irish Times 22/8/2018 (based on YouGov survey for McDonalds Ireland)

Amazon Case Study

- The telework concept is a key tool for Amazon and delivers a key part of the “infrastructure”.
- The challenge for companies in rapid growth phases is planning man power and providing for the physical infrastructure to support an expanding work force. In response to this challenge, Amazon is deploying the model of “VCC” (Virtual Call Centre) to complement the physical structures
- The VCC has key requirements in terms of connectivity for workers who telework, they need a minimum of 30Mbps download speed and 10 Mbps upload. They also need a dedicated line as well as a contingency back up line.

Enterprise, Entrepreneurship & Jobs Benefits – Teleworking studies

It raises employee productivity

- A recent study of call centre workers in Ctrip -a Chinese travel website - were given the option to volunteer to work from home for nine months. Half the volunteers did so; the other half was the control group and thus continued to work at the office each day. The study revealed that "people working from home completed 13.5% more calls than the staff in the office did-- meaning that Ctrip got almost an extra workday a week out of them.
- A further study, by Gallup, found that employees who work from home three to four days a week are 33 percent more likely to "feel engaged" and 15 percent less likely to feel "not engaged" than employees who report to the office each day.
- Numerous studies have found that increased employee engagement boosts productivity.

It reduces attrition rates

- The cost of employee turnover is huge. Depending upon the study, recruiting, hiring, and training a replacement after an employee departs can cost up to two full years of that employee's salary.
- In the Ctrip study, the employees who worked from home reported "much higher job satisfaction" and "quit at half the rate of people in the office", a result that Bloom said "was beyond what we anticipated".
- In addition to lowering the attrition rate, a work-from-home policy can make it easier to recruit new employees. This is especially true for Millennials, according to a 2018 study at the University of Akron, which found that "41 percent of them state that they prefer communication via electronics as opposed to in person or over the phone."

It lowers facility costs

- A recent study in Australia showed that they are happier and more productive at work if they have completely enclosed private offices. However, that study had an important omission: It did not treat working from home as a testable alternative.
- When employees can work from home to accomplish tasks that require concentration and no distractions, they will be less likely to require privacy and quiet when they do come into the office. Therefore, allowing employees to work from home may be the best way to get the lower facility costs of an open-plan design without impacting productivity.

It results in fewer sick days

- In the US, around 2.8 million workdays are lost each year due to absenteeism equating to a \$1 million loss per day.
- However, when employees can work from home, they're more likely to do so when ill, resulting in fewer sick days

Enterprise, Entrepreneurship & Jobs Benefits - Teleworking

Case Study – Teleworking Shopify

Shopify is a Canadian e-commerce firm headquartered in Ottawa. It develops software for online stores and retail point-of-sale systems. It was originally founded after its owners developed software for their online snowboard store. The platform is currently used by more than 350,000 merchants with sales of over €670 million (2017). Shopify now employs over 200 people in Ireland; most of whom are based in the West. All Shopify staff work from home; there is no Shopify office.



Shopify staff in Ireland are located across the Western Region; with Galway centralised as its hub city. There are already some clusters of staff in towns like Carrick-on-Shannon, County Leitrim, and Boyle, County Roscommon. They also have staff in Sligo, Donegal, Clare and naturally a large cohort in Galway. Staff do get to meet though; Shopify hosts monthly social meet-ups, mostly in Galway but events have also taken place in Sligo and other areas.

Caitriona Foley lives in Loughrea where she has fibre to the home with eir (with 50 mbps).

She has experienced the benefits of working from home first hand. She runs a successful award-winning wedding planning business called True Romance Weddings, while raising a young family and working for Shopify as Team Leader. She needs access to iCloud and sufficient bandwidth for video-conferencing. In customer services, they run three live chats at a time so minimum speeds and connectivity 100% of the time is vital. “I joined Shopify as Customer Success Guru in October 2016 and have honestly never had a job like it. I am a mum of one and in my spare time I run a wedding planning and stationery business, but also needed a full time job that would pay the bills. Working at home for Shopify, allows me to meet new challenges every day, get more time with my son and avoid traffic jams while commuting. The company recognise that happy employees produce better results.”

Enterprise, Entrepreneurship & Jobs Benefits

A small business in the Intervention Area

Location: Boolereagh, Knock, Roscrea, Co. Tipperary.

Owners: Ailish & Enda Hennessy

12 employees (Full time & Part Time)

Restaurant & Cookery School



Fiacri Country House is an award-winning restaurant and cookery school in a rural location in Tipperary. The nearest town is 10 kilometres away and it is located in the NBP intervention area. They also run a cookery school from the site, with Tuesday nights dedicated to demonstrations.

The restaurant moved to a local operator (Orion) that provides a wireless network infrastructure. The level of service has improved but they still encounter problems, i.e. the payment system can drop on occasions, uploading video content can take a long time.

From a back-office perspective, the relatively low-technological nature of the business (i.e. limited reliance on cloud computing, video conferencing technologies etc.) means that current broadband is generally sufficient for the needs of the business. In summary, a higher broadband speed would significantly improve the business of Fiacri Country House.

“Customers can get very frustrated with the slow broadband, everyone wants to be connected all of the time, they want quick responses and want to see new content all the time, i.e. blogs etc. It takes a long time to upload any content. We would also look at blogs for the cookery school if we had reliable broadband speeds”.

“About 20% of our business comes from our website and it is our main advertising tool. I would expect this to increase if we had better broadband and we could look at taking on more employees”

- Interview with Enda Hennessy

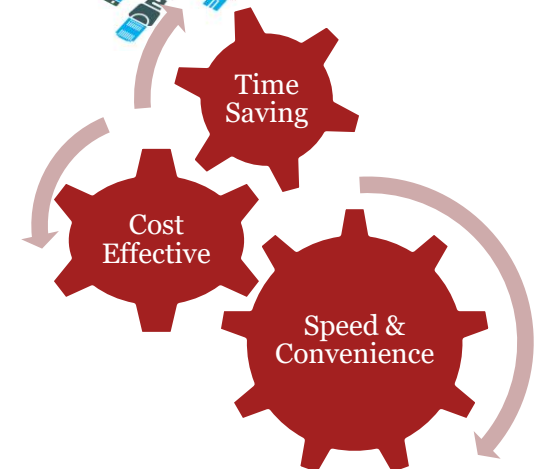
Cloud Computing benefits for business is made easier by high speed broadband

Having high speed broadband is key to business availing of these benefits:

Benefits of Cloud computing



Irish Revenue is moving to PAYE modernisation and Real Time Reporting as of 1 January 2019.



1

Scaling Infrastructure - Cloud-based data infrastructure is efficient, inexpensive, and responsive to demand. By paying only for the server load you need, your costs for data management can scale with use, providing the most economical solution for small businesses.

2

Cloud based office systems - “Living documents” on cloud-based office systems reflect changes by all users instantly, allowing a fundamental shift in collaboration between employees i.e. Google’s G Suite - allow multiple users to work simultaneously, with all changes reflected in real-time across an unlimited number of devices. These digital workspaces also significantly reduce the responsibilities of IT professionals in infrastructure management, freeing up time and resources for big picture projects such as data analysis.

3

Remote workspaces - Cloud-based office systems also drive location-independent office environments. The ability to collaborate over cloud services allows employees the flexibility and support to work remotely or to continue projects while away on conferences and trips. Other cloud-hosted services such as Skype keep lines of communication open between collaborating groups and managers. Cloud technology also breaks down social barriers for individuals with small children or a disability, providing a foundation for a more inclusive workforce.

4

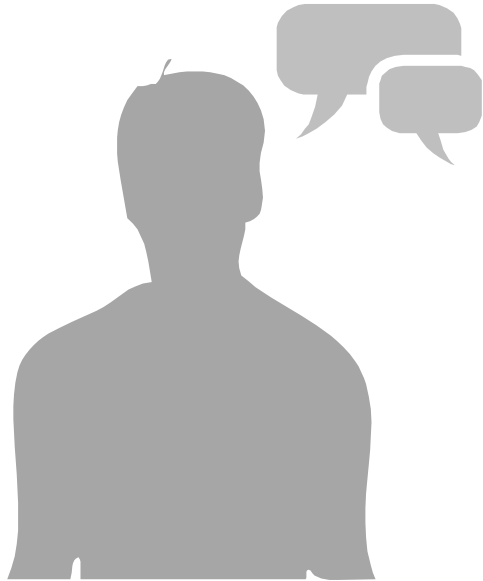
Big data analytics - More companies are shifting their focus to user-friendly data analytics interfaces, bypassing many of the costs associated with analyzing such large quantities of information. The ability to make better decisions based on deep customer data offers big advantages, such as delivering more relevant information to your customer base in a more timely manner or adjusting to customers’ wants and needs in real time.

5

Backups and recovery - Cloud-based data storage helps address security concerns by building redundancy into a company’s information management approach.

Enterprise, Entrepreneurship & Jobs Benefits

Quotes...



"We see digitalisation and online developments as a huge opportunity for the the retail sector in Ireland. Retailers are moving from the traditional bricks and mortar model, to a more omnichannel style offering. This involves meeting the consumers' needs through a number of different channels and touch points, websites, social media, email offers etc. as well as through in store engagement. Retailers are interacting with customers showing products and offers, and are delivering a consistent message across each channel. This expands the customer experience and can build brand loyalty. Consumers are sophisticated and they expect the same from retailers.

Similarly technology can impact all aspects of the business i.e. logistics, fulfilment, digital offering in store. Obviously, having high speed reliable broadband is a necessity for retailers to deliver on these strategies.

Without access to high speed broadband, modern retailing will not be possible for Irish retailers and the industry would shrink. Today research shows that roughly 60% of all online sales in Ireland are already going to internationally based pure play online retailers. These companies have no physical presence in Ireland and therefore make a limited contribution to the Irish economy. If Irish retailers are to successfully compete and challenge international players, the Government will need to deliver on the National Broadband Plan"

Thomas Burke | Director, Retail Ireland, IBEC

Enterprise, Entrepreneurship & Jobs Benefits

Quotes...



“Digitalisation is fundamentally changing the way in which companies do business – it is pervasive in its impact and is transforming all sectors of the economy. The use of technologies presents significant opportunity to improve productivity and competitiveness. Through the use of technologies today, businesses can capture opportunities to internationalise, reach new customers, deepen customer relationships and respond more effectively to their needs.

Technologies that many of us thought were ‘way out there’ are now the reality for businesses and people at work – whether it’s augmented reality, artificial intelligence or virtual reality. Digitalisation is shaping how we work and the jobs of the future - companies can now tap into a locally dispersed as well as global workforce and individuals can tap into a range of occupations and careers where technologies play a role.

Ireland has a strong reputation internationally for its capabilities in information and communication technologies. The ambition is that all of our enterprises throughout the country are enabled to take advantage of opportunities and access to high speed broadband is crucial to realising that ambition.”

Maria Ginnity | Enterprise Policy, Tax and Infrastructures, Department of Business, Enterprise and Innovation

5. Social Inclusion & Rural Development

Benefits to Social Inclusion

Introduction

Access to high speed broadband services through the roll out of the NBP to the Intervention Area will promote social inclusion, by ensuring equal access to online services and promoting sustainability of rural communities with positive implications for the life experience of many of the most vulnerable members of society, in particular the elderly.

Broadband access can also support the progress of Ireland's National Action Plan for Social Inclusion (NAPinclusion) which aims to enable the most disadvantaged to fully participate in society.

Case Study – Castlemanor Centre for Social Gain

- The Castlemanor Community Centre in Cavan has obtained 1 GB broadband connectivity.
- The Centre for Social Gain runs various initiatives for older people (all in their late eighties) in Cavan and Monaghan with the aim of promoting a positive attitude to ageing and combating isolation.
- Ultra high speed connectivity has enabled the centre to expand the services provided to include computer classes.
- This has enabled members to talk to relatives around the world and stay connected with family and friends.



eGovernment

An array of government services are now available to access online. In addition to the payment of taxes, access to services such as grant applications online means people in rural areas with reliable broadband access would not have to commute to urban areas and towns to carry out various personal administrative tasks.

Social Networking

The opportunity that social media presents for everyone to stay in touch, no matter the time-difference or geography, is an important factor in social inclusion. In addition, video-calling service, Skype, allows people to keep in contact face-to-face but requires fast internet access and streaming and is an expensive feature if it is accessed via 4G offerings.

Online Banking

With the move towards online banking, and other services moving to online, such as payment of property tax, motor tax, and the EU requirement of farmers to fill out basic payment scheme (BPS) forms online from 2018 onwards, people in rural areas find it difficult to access these services as a result of the lack of reliable broadband.

Benefits to Social Inclusion

Rural Regeneration

The infrastructure of a high speed broadband network in rural/regional Ireland will support the new Rural Regeneration and Development Fund, which commits €1bn over the period 2019-2027. Investments of scale into the rural economy under this fund will be strengthened by the availability of high speed broadband.

Early connection will be key for communities

The deployment of the State intervention network will take time to complete. In the first year of deployment over 280 Strategic Community Access Hubs (now referred to as Broadband Connection Points) will be connected by the company appointed. These will mean key facilities in every county will receive a high speed connection while the wider rollout continues. Each facility will have ancillary support such as hot desks and public wifi. These hubs have been selected at local authority level, with input from the NBP team.

In April 2017, the European Commission launched its 'EU Action for Smart Villages'. There are three main pillars of the rural digital divide: broadband infrastructure, the uptake of digital services and the digital literacy of the residents. Developing smart villages is a key action to bridge the digital divide which requires broadband and will have a benefit of social inclusion in rural Ireland.



EU ACTION FOR SMART VILLAGES

Smart villages are rural areas and communities which build on their existing strengths and assets as well as new opportunities to develop added value and where traditional and new networks are enhanced by means of digital communications technologies, innovations and the better use of knowledge for the benefit of inhabitants.

FIVE DRIVERS OF SMART VILLAGES

1. Responding to depopulation and demographic change;
2. Finding local solutions to public funding cuts and the centralisation of public services;
3. Exploiting linkages with small towns and cities;
4. Maximising the role of rural areas in the transition to a low-carbon, circular economy;
5. Promoting the digital transformation of rural areas.

“Key outcomes will be to support sustainable community and economic development in rural Ireland, including through regenerating smaller towns and villages and encouraging entrepreneurship and innovation to support job creation in rural areas.” DRCD

Source: Smart Villages revitalising rural services 2018 - ENRD

People with disabilities

- Access to NGA broadband services can provide significant improvements to quality of life for people with disabilities living in Intervention Areas.
- ‘Smart’ home technologies hold enormous promise for persons with disabilities, and can help facilitate independent living. These technologies require access to high speed broadband to be effectively leveraged.
- Some examples are as follows:
 - For people who are blind or have low vision, smart homes allow for easy control of appliances and the home thermostat, all at the touch of a button on a smart phone or device.
 - For people with mobile-related disabilities, smart home technology can allow the user to control appliances in the home that may be difficult to reach, such as lights, door locks or security systems.
 - For people who are deaf or hard of hearing, one benefit of home automation technology is improved security. Suspicious movement can be picked up by sensors outside the home and alerts can be issued.
 - Smart technology can allow other family members to monitor locations.
- A significant number of new technologies have been developed that can assist people with disabilities i.e. voice, language and speech, video.
- Overall ICT advancements have had sufficient benefits for people with disabilities in the area of communication, employment opportunities, healthcare, access to education and quality of life.

“Broadband is vital to enable people with disabilities to live independently. From security to remote monitoring, good internet access is required. It also assists us to more easily provide services and supports”

Siobhan Long – Enable Ireland



Tusla Social Workers – Case Studies

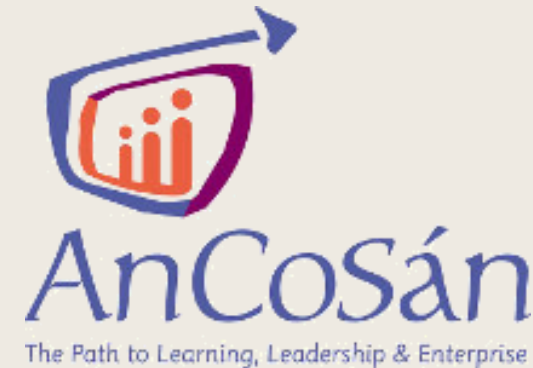


The Kerry Administrative Area	With NBP <i>There are 17 Administrative Areas in Tusla. The Kerry area moved from a paper based system to an online National Childcare Information System in February 2018. The system is accessible online via secure log in. Having access to broadband means that Social Workers in Kerry no longer have to drive long distances back to either the Tralee or Killarney Office following family visits to update paper files. Case notes can be updated and added from home. This results in reduced travel time, fuel costs, greater efficiency in carrying out administrative tasks and improved well-being of the social workers who previously spent significant portions of their day on the road.</i>	No NBP <i>Without Broadband Social Workers cannot access the new National Childcare Information System remotely which results in them have to drive into a Tusla local office to access key information. In the case of a Social Worker in Kerry this results in someone driving 80 to 100 miles to access key data that is required urgently to ensure the safety of a child.</i>
The Donegal Administrative Area	With NBP <i>Social Workers in Donegal are now attending Court with their laptops and presenting their cases using the new National Childcare Information System securely on-line. Social Workers are able to gain real time access to case data on their laptops thanks to broadband access being available in the rural Court. After the case, the social worker updates the case file in a quiet room at the court rather than returning to a local office. They are then able to go home at a reasonable time with all files up to date and available online to other Tusla staff in other parts of the country.</i>	No NBP <i>Prior to attending court for a specific case all paperwork is printed off and compiled by either a Social Worker or local admin staff. Carrying around large volumes of paper work presents a high level of risk and can lead to sensitive data being lost or damaged. After the case is heard in court, the Social Worker drives back to the local office and writes up the case notes long into the evening before heading home.</i>

Social Inclusion

Case Study – Community Development Officer, An Cosán

- An Cosán offers a variety of programmes in early years education and care, parenting, community, further and higher education. The organisation has also established a Virtual Community College to cater to people across Ireland
- The rolling out of virtual study hubs in rural areas enables students to participate in online courses which is all part of a national strategy to set up "communiversities" to encourage people to learn together outside of the university campus
- Wider and reliable remote access to broadband for case workers would enable them to do administrative tasks on the move rather than coming back into the hub office.
- Work loads that case workers need to manage and level of downtime generated by the need to manually document case notes and then input onto central system is highly time consuming. It was highlighted that if there was wider access to broadband, this would enable the case for a common toolset for case workers to facilitate mobile tool/app which could be updated on the move for both case notes and dealing with critical incidents.



Quote...

“The DRCD runs a senior alert scheme to provide enhanced sense of security to elderly people living in rural Ireland. We are rolling out new solutions that provide comfort to people that they are being looked out for and allow them to stay in their home for longer. Access to high speed broadband can help in achieving this enhanced security”

Stjohn O'Connor, Dept. of Rural and Community Development

6. *Tourism*

Tourism

Introduction

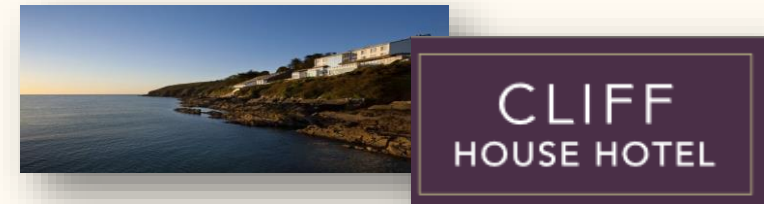
The NBP will deliver significant benefits to the tourism sector, which has a disproportionately high share of businesses located in rural areas of Ireland and are currently constrained by basic broadband. Access to broadband is reflected in Failte Ireland's advocacy for the extension and upgrade of broadband services and access in rural Ireland. This was highlighted as a key action in the 'Driving Tourism Sustaining Communities' strategy issued in 2017.

A hotel in the Intervention Area

Cliff House Hotel & Spa, Ardmore is a five star hotel in one of the most prestigious and successful tourism areas in the West Waterford and wider East Cork region of Ireland. It is located 14km from Youghal and 22km from Dungarvan, the hotel is in the NBP intervention area. The resort comprises an 39-bed luxury hotel and 1 villa (with 3 rooms). The House Restaurant at Cliff House Hotel carries a Michelin star rating. Over 70% of their customers are domestic with the remaining coming from US, UK, Germany and France. The hotel has a high occupancy rate all year round. Cliff House has sisters hotels in Dublin and Lyons Estate in Kildare, which are owned by Barry O'Callaghan.

The hotel is served by Clearwave, a wireless radio connection at an annual cost of €10,000. This currently provides a service level that is adequate but results in the hotel missing out on other business opportunities due to the lack of upload and download speeds and also the lack of bandwidth. Some examples of limitations of the services that have affected the business operations of the hotel are as follows:

- Selling business services from the hotel;
- Centralised reservations service for the entire group that operate from Waterford;
- Centralised purchasing system for the Group;
- Reliable interface with a number of different databases i.e. spa booking, table bookings etc.;
- Ability to expand its services and therefore increase employment in the area;
- Allow employees to work remotely.



From a back office perspective, the relatively low-technology nature of the business (i.e. limited reliance on cloud computing, video conferencing technologies) means that broadband is generally sufficient for the needs of the hotel.

"When guests come and stay with us they expect to be able to communicate with friends, loved ones and in some instances their businesses while also to keep the kids happy. We recognise how important it is now that they do not feel cut off from the outside world whilst on holiday, which is why having a reliable high speed broadband is key to our business".

"In the peak season, connectivity can be slower which affects our entire business".

"We would love to let some of our long standing employees work from home but due to lack of high speed broadband, this is just not an option".

"It is hard to book a meeting for 20 people as we cannot guarantee 100% access all of the time".

"Customers (particularly international customers) and staff are frustrated and do not understand why the hotel cannot get high speed broadband".

Interview – Honor Byrne, Director of Sales & Marketing

SMEs in the Tourism Sector



- Whale Watch West Cork is run by Nic Slocum and is based in Baltimore, offering boat trips to tourists around the West Cork coastline for sightings of dolphins, whales and seals as well as other marine animals.
- “Communications is one of the most important issues for my business and obviously reliable broadband is essential. With 70% of my business coming from my website, I need to be constantly updating my content though posts, photos, videos and blogs. It is a great way to attract and engage customers in the whole experience.”
- “My current wireless broadband is expensive and not very reliable”.

Interview with Nic Slocum



- TurfnSurf is a family run tour company, hostel and activity provider based in Bundoran on Ireland’s North-West surf coast. They offer accommodation, surfing, sea-kayaking, stand-up paddle-boarding and Blo-karting. The business was established in August 2006 by husband and wife Killian and Mary O’Kelly. They employ 15 people (as of August 2018).
- “100% of my business comes from the internet, from the likes of booking.com and Airbnb”.
- “Having reliable internet is vital to the success of my business, be it communicating with customers, uploading content to our website or maintaining records”.

Interview with Killian O’Kelly

SMEs in the Tourism Sector



- PwC interviewed the management/owners of several other tourism businesses to evaluate the impact of NGA broadband services. The general view was that the availability of NGA services enabled some internal improvements in operating efficiency, specifically faster credit card machine transactions and avoided “go-slow” periods in the back office systems.
- The primary benefit identified was the ability to offer free, quality Wi-Fi to guests. This was as relevant to a tourist in Brittas Bay as to the business traveller in Cork. Improved guest satisfaction was broadly considered to be positive, albeit not a “game changer”, in terms of the ability of the enterprise to attract business.
- Hotels were an exception in this regard. They indicated that without reliable broadband, they would lose business.



“The internet and social media play a significant role in the tourism industry, especially in the information search and decision-making behaviours, and have become invaluable tools for tourism businesses to promote themselves to a global audience. With more visitors seeking information and recommendations on destinations and making bookings online and sharing their holiday moments on social media, it is crucial that those providing tourism services in Ireland, particularly in rural areas, have access to high quality and reliable broadband to ensure they can market themselves effectively and provide a high quality visitor experience”

Paul Keeley – Director of Commercial Development, Fáilte Ireland

SMEs in the Tourism Sector

Park Hotel - Dromquinna

- Owned by brothers, Francis & John Brennan
- 2 Locations in and near Kenmare, Co. Kerry
- 130 employees (Dromquinna – 75 ; Park Hotel: - 55)



- Dromquinna Manor, is a waterside estate, set on 40 acres of parkland. The Manor, dating from the 1890s, is dedicated to catering for weddings and events, for up to 180 guests. There is also a separate restaurant on the waterfront site called The Boathouse Bistro. The location accommodates camping and can cater for a small number of RV/Motorhomes. The Bolthole is a self - catering house on the grounds of Dromquinna, which can accommodate up to 6 people in 3 bedrooms. The majority of the customers come from Dublin, Cork or overseas. The Park Hotel is a 46 room hotel in Kenmare.
- The Brennans purchased the Dromquinna Manor in 2013, and encountered many problems, not least the lack of reliable broadband speeds. It affected all aspects of the business, including reservations, marketing, processing transactions at bar, back office systems etc.
- “I had to introduce a cash only bar as there were queues because the payment processing was so slow”.
- Everything changed 18 months ago when a new fibre optic service was provided, linking Kenmare to Sneem. It is a “first class service” most of the time.
- “Reliable high speed broadband is crucial to all parts of our business and has a huge impact on the day to day running of both the hotel and the Manor. The booking system is online, our backup is on the cloud, and purchasing, bills and statements can be looked at online. Social media presence is essential to promote our venues, and the fact that we have fibre broadband means that our customers can communicate with the rest of the world using Facebook, Twitter and WhatsApp.”
- “90% of reservations come from online activities. Sites like Tripadvisor are very important to the marketing of the venues”.
- “80% of the payment are with cards and we have no issues with delays now”.
- “Last week we had an issue with the broadband, it was down for a period. Everything was slower and we got a taste of what everyone is constantly complaining about. We had got used to a first class broadband service”.

- Interview with John Brennan | Owner

SMEs in the Tourism Sector

Lough Inagh Lodge – Connemara



- Owned by O'Connor family
- 13 rooms lodge located in Recess, Connemara, Co. Galway
- 20 employees
- “Having high speed broadband would make everything about managing a venue of this nature so much easier, be it our website, booking system, back office services, marketing to the overall customer experience”.
- “There are great technology developments out there that we could implement if we had the bandwidth and it would save time in many of our processes in the lodge”.
- “Broadband is considered as important as water”.
- “The lodge would like to expand into conferencing, for which good Wi-Fi coverage is crucial. We have often had enquiries about renting out the entire venue for conferences but without us investing in a short-term broadband solution (satellite) that is costly, it is not possible to deliver the kind of service business users require. We also have an issue with the mobile signal and it is very difficult to explain to customers why they can't “skype a child living in France”.
- “We are 11 kilometres from the nearest exchange so without fibre we are relying on satellite which is costly.”

Interview with Domonic O'Morain, General Manager



- “The west of Ireland can't get business tourism because of lack of high speed broadband, and we can't even bid on many events. The value of this business to Ireland is €720 million a year and we can't ever get a slice of the pie. It is not a level playing pitch for the regions in terms of tourism”.
- “We also have bad phone coverage in some areas, and it is impossible to attract customers with this constraint”.
- “I am trying to encourage tourist related business to develop a digital presence i.e. website, advertising on intermediaries like booking.com, TripAdvisor, Airbnb and this is very difficult when the broadband infrastructure is not in place to support businesses”.
- “25% of activities providers are online in Europe, the number in Ireland is only 9%” How can these providers compete? It is a huge issue for the development of the tourism sector in the West”.
- “Having access to high speed broadband would attract people home. It would have a positive impact on employment and the entire regional economy. Less traffic issues, prosperous local communities with people eating and meeting locally”.
- “Broadband creates opportunities for people to work remotely”.

Interview with Miriam Kennedy, Head of Wild Atlantic Way, Fáilte Ireland

7. Transportation

Transportation

Introduction:

The National Planning Framework has projected an additional 1 million increase in Ireland's population by 2040 with 25% planned for Dublin, 25% across the other four cities combined (Cork, Limerick, Galway and Waterford) with the remaining 50% of growth to occur in regional centres and rural areas.

This growth will naturally put a significant strain on the national transport network, however, the successful roll out of the NBP across Ireland can help the transportation system evolve to meet the challenges it will face from more people on the roads across both urban and rural Ireland.

Traffic management:

The roll out of the NBP to all parts of Ireland can provide an enhanced benefit to the management of Ireland's national roads network and coordination of traffic control facilities. Effective traffic management relies on access to real time information to avoid significant disruptions to our roads network.

Intelligent Transportation Systems (ITS) are a technology used by the Motorway Traffic Control Centre (MTCC) which enable road users to be better informed and make more effective use of transport networks. This is as a result of the technologies being able to provide real time travel information and active management of unplanned events and incidents.

These proactive and real time services rely on the ability to share information as incidents occur and reliable high speed broadband can help in ensuring these services continue to improve and enhance the overall management and coordination of Ireland's road networks.



Transportation

Electric Vehicles

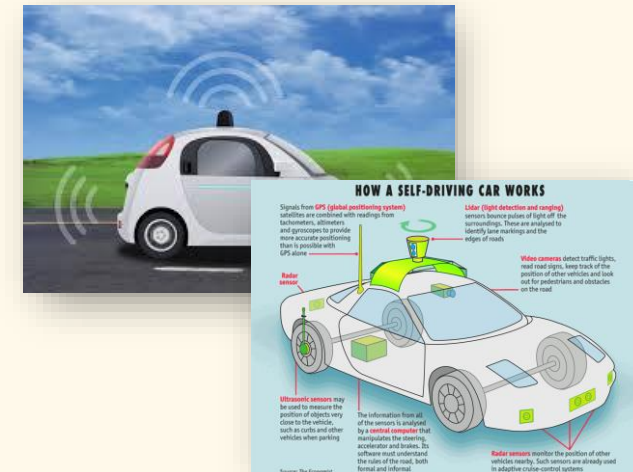
Ireland has set itself a target of 2030 to end the sale of petrol and diesel cars which would result in our roads being solely occupied by electric and hybrid vehicles beyond this point. Currently there are approx. 900 charge points situated across Ireland to accommodate 3,800 electric vehicles¹, however, with the demand for these vehicles likely to increase year on year, there will be a need for a more extensive network of charge points across all parts of the country.

The charge points will offer smart charging and metering services and will be key components to help customers see availability online and choose to charge at off-peak times while allowing the grid to draw spare energy from electric cars' batteries while charging. A broader charge point management system will manage and control the network in real time with digital tools providing customers with real time charge point availability maps. For the successful connectivity of these smart and real-time services, reliable high speed broadband throughout Ireland will be essential.

Automated vehicles

While we are yet to see self-driving cars on our roads, developments and trials in the US and elsewhere point towards the likely introduction of automated vehicles at some point in the future. These vehicles will require low-latency technology in order to be licensed by regulatory authorities. Self driving cars will need to be able to interpret the roads correctly as they drive, or in other words they need to have all information about the route they are taking in real time. This can be from traffic delays, road closures to a dog running in front of the vehicle.

In order for this to be successful, roadside sensors or a wireless broadband standard that can speed up connections and have broadcast capabilities could allow networks to distribute mapping data in real time. High speed broadband access throughout the whole country will position Ireland to be better equipped when this advanced development reaches our shores and roads at some point in the future.



Source: PwC Analysis

1. Irish Times, 'Electric Cars about to become the 'new normal' in Ireland', Wed April 18, 2018

8. Health

Health

Introduction:

The potential patient benefits and financial savings associated with eHealth services in remote parts of rural Ireland are demonstrated in a number of Irish case studies set out in the pages below, and in a case study of an eHealth pilot in rural America. Benefits extend well beyond the financial, and include significantly improved life quality for individuals suffering from chronic ailments, reduced pressure on struggling primary and acute healthcare systems, and better care outcomes for the general population.

Example from the US

- This case study from the US shows how eHealth reduces the number of hospital readmissions following discharge of a patient with Congestive Heart Failure (CHF)
- A pilot programme was undertaken in Texas with a number of partners, namely, Vivify Health and Christus Health. The pilot involved 44 patients. AT&T provided the infrastructure and telecoms service required for the pilot.
- The objective was to reduce the hospital readmissions of high-risk patients diagnosed with specific chronic illnesses such as: Congestive Heart Failure, Hypertension, Diabetes, Chronic Obstructive Pulmonary Disease. Patients with these diseases commonly have complications that result in readmissions to the hospital within 30 days of discharge. The pilot ran over one year, the patients selected had an average age of 66
- The trial used the following technology: Remote Patient Monitoring System (RPMS) including 10" Android tablet, and Bluetooth paired personal health devices: weight scale, blood pressure monitor, pulse oximeter. With appropriate connectivity, patients could engage in real time interactive videoconferencing with care givers.

- The key finding was that technology resulted in a 90% reduction in costs.
- In addition hospital readmissions were reduced by 65%
- Prior to the pilot the average cost was \$12,937. The patient cost in the pilot reduced to \$1,231.
- The initial cost of the monitoring equipment per patient was \$1,318
- Thus the pilot provided a pay-back within just 42 days.
- Due to the success of this pilot Christus Health are expanding RPMS (Remote Patient Monitoring System) across the health sector.

Christus Health in Texas found a 90% reduction in the costs of treating CHF patients over a 12 month pilot trial via a Remote Patient Monitoring System



Smartphone application



Spirometer



Pulse oximeter



Health – Irish Case Studies

Case Study 1 – Managing Chronic Ailments

Joanne is a 35 year old female living in rural Mayo. She has suffered from the degenerative lung disease, Cystic Fibrosis (CF), from birth and attends the specialist CF unit at St. Vincent's Hospital – some three hours drive from home.

She has been attending the same GP since childhood, but she is his only CF patient and his understanding of the disease is low.

She has been excessively tired of late and is concerned that her disease has progressed.

With NBP

Joanne drops an email to her nurse liaison at SVUH and an online consultation time is set up for that afternoon. Using equipment provided by the hospital, Joanne is able to provide the nurse liaison with details of her vitals and explain in person the symptoms which she has been experiencing. The nurse advises a planned admission to the CF unit at SVUH for the following day. Joanne is driven to the hospital by her mother and is admitted for a week while the situation is brought until control. She returns home feeling much better.

No NBP

Joanne is dependent on her working mother to drive her to Dublin for an attendance at SVUH and is afraid that the journey may be in vain. She has felt like this on previous occasions and it turned out to be little more than a common flu. She decides to “tough it out”, going to bed early for the weekend using her nebuliser for an extra hour per day. Things don't improve and Joanne ends up attending the ED of her local regional hospital. Her immunity is very low and the infection risk is high, but time is not on her side. She is transferred to SVUH by ambulance and remains in hospital for four weeks recovering from a severe infection.

Case Study 2 – Early Hospital Discharge

John is an 82 year old man from between Sneem and Kenmare in Kerry. Recently, John's eyesight has started to deteriorate and his doctor suggested he visit an eye specialist in Tralee Hospital. On foot of this, he was admitted to hospital for retinal detachment surgery. The expected length of stay is five days, as John has a heart condition which requires him to take warfarin daily. John does not like being away from home as his animals depend on him. He lives alone, but his daughter Nora is nearby and is a frequent visitor.

With NBP

John is doing very well after this surgery, notwithstanding the risks associated with his warfarin dependence. Medical staff assess him as suitable for an early discharge, subject to his agreement and him having access to an in-home remote monitoring device (e.g. Smart TV). John calls Nora to pick him up. At home, Nora sets up the technology to accept a remote monitoring visit scheduled for the following day. John's progress is as expected after three days and he is formally discharged from the care of Tralee Hospital.

No NBP

John is required to stay in hospital for 5 nights, and Nora travels the 100 mile round trip every day to ensure that he is well minded and not lonely. In the public ward, John cannot sleep and is not feeling the better for his hospital stay. After 5 days, he is discharged to home.

Health

Potential for remote monitoring

- This considers the scope for e-Monitoring as a tool in improving the efficiency of the service delivery model. The benefit of real time monitoring is that patients are monitored and any changes can be quickly identified with the clinicians recommending changes to the medical plan.
- In the absence of real time monitoring the patient goes unchecked and thus a preventative approach is not possible. The outcome is very often the patient presents at the emergency department with complications. Thus the condition may worsen with the patient requiring extended periods of hospitalisation.
- Hence the benefits for the patient are improved quality of life, relevant therapy and care through mobile monitoring, and the patient is better able to lead a normal life.
- There are significant benefits for the health care system. Such examples include cost savings through minimised treatment in the hospital, better management of healthcare resources, minimizes patient security issues and post-treatment care issues, accurate data supports correct diagnosis that saves resources.
- International research indicates that “remote patient monitoring” can result in savings in medical treatment of chronic diseases of up to 30% per patient.

International research indicates that “remote patient monitoring” can result in savings in medical treatment of chronic diseases of up to 30% per patient

- A simple benefit of improved monitoring of chronic disease patients may be a reduction in the requirement for “out of hours” GP services.

*“I had a small procedure that inserted a device onto my heart. I was monitored remotely by the team in the cardio unit in the Mater for 10 weeks and they identified an issue from the data collected. I needed a pacemaker. It was all done remotely and I did not even have to travel to Dublin for the diagnosis, so efficient”
Michael, 76 year old heart patient*

PwC estimates the impact of eHealth to be equivalent to a cost reduction of 3%. Part of this is attributed to remote monitoring on the average length of hospital stay. Remote monitoring also reduces the cost of treating chronic disease patients where international reference is a saving of 30%.

Health

Compelling benefits

- Massive overcrowding at Irish hospitals has become a major issue and is a key challenge for government in terms of addressing “Patient Safety and Health” as well as dealing with the “Perception of general mismanagement”
- Technology can be used to alleviate the pressures on the hospital system. In the US, Netherlands, Croatia and Brazil there is growing experience with mobile health, e Health and tele-health.
- Technology can complement the work of clinicians in delivering care to patients, e-Monitoring can reduce the number of visits to day clinics and can accelerate the discharge from hospital post medical procedure. This has a very important role in creating bed capacity and avoiding long term hospital stays.
- E-Monitoring has a long term role in supporting the growing older demographic and long term care needs for those aged 70 and over.

Over crowding in hospitals

“There are 714 patients on trolleys or on wards awaiting admission to a hospital bed on Monday – the highest number ever recorded.”

Irish Times, 12 March 2018

“It concludes that the current health system is not fit for purpose. It warns of further risk to patient safety if health service reforms are not implemented quickly. And it advises that, without reform, 7,000 acute hospital beds, 12,000 residential care beds and a 37 per cent increase in the workforce would be required by 2031.”

Irish Times, 29 January 2018 (in relation to Bed Capacity Review)



E-Monitoring can help support the early discharge of patients and thus free up needed hospital beds



Health - Benefits of High Speed Connectivity

Access to technology and eHealth advances is an important benefit for the healthcare sector and would be supported by the National Broadband Plan. eHealth empowers those wishing to access healthcare provision to proactively manage their own health from remote settings, while reducing costly hospitalisations and directing those with health concerns to the most appropriate setting of care.



Access to services

- Ability to deliver basic and enhanced health services to rural and remote communities
- Utilisation of the health workforce through remote healthcare delivery models can improve efficiency gains in health service delivery
- Care can be brought to remote rural areas where distance to care may otherwise have been an issue
- Ability for patients to locate health-care providers that offer the services they require
- Access to second medical opinion from remote specialists
- eHealth allows remote monitoring and management of patients from settings such as the home and allow consultations to be conducted regardless of distance between patient and doctor. Travel time is reduced for the patient and general convenience is improved.



Examples of current & potential services

- Technology devices such as blood pressure monitors, glucometers, lung capacity monitors and others are deployed to the remote setting (most often the home) and regular measurements are made using the devices deployed
- The data is typically transmitted back to a monitoring base (often a hospital) where decision support systems featuring pre-set alarms, alerts and management care flows, assist attendant care personnel.
- A post office in Ballymore Eustace, Kildare has become the first in the country to offer online GP consultations, aimed at people who may have difficulty accessing traditional GP services. This service offering is in partnership with VideoDoc where people living in areas with limited access to traditional GP support can avail of an online video conferencing service to gain instant access to an IMC registered doctor.

Case Study 3: Bantry, Co. Cork

Poor broadband access in hospital sites

A patient's care can be compromised by slow broadband connection both within the hospital, and in the homes of healthcare professionals who require the 'always-on' capability. This can particularly be the case in rural hospitals, which are generally classified as model 2 and model 3 hospitals.

Effect of broadband on patient care

The speed of broadband in Bantry General Hospital, Co. Cork, is only 10 MBPS which inhibits effective upload and download capabilities of items such as scans and blood results. In addition to download speeds, it is impossible for numerous members of staff to be logged into the systems simultaneously given the nature of their broadband capability.

The surrounding areas of the hospital are also of great importance, as many of the hospitals healthcare staff live in these areas. For example, the download capabilities of doctors who are reading scans remotely are gravely affected by the lack of speed of the broadband provided to their home. Faster download speeds facilitate faster decision-making, particularly when the medical case is time-sensitive for instances, such as, reading a scan of a hyper-acute stroke patient so that decisions can be made more efficiently on treatment.



Effect of broadband on healthcare professional training

Healthcare professionals in training are also affected by slower broadband connections. Faster online connectivity facilitates online video conferencing to connect with continual professional development training schemes rolled out by medical training colleges in Dublin, such as the RCPI, and also enables educating junior trainees across the healthcare profession. This is of particular importance, given the standard of work expected of healthcare professionals. The video conferencing connection in Bantry Hospital is intermittent and often does not connect to begin with. On top of educating junior trainees, trainees need to be trained in real-time scenarios that are time-sensitive and therefore, areas with slower broadband services should not compromise the training of junior doctors and nurses, or any other healthcare professional.

In a separate review carried out by the Irish Medical Council, it found that medical interns in University Hospital Kerry identified the need for broadband across all areas of the clinical site in order to have access to library databases and the ability conduct literature searches.

“I could physically see more patients if I had a faster system.”

Dr. Brian Carey, Consultant Geriatrician

Case Study 4: ProACT

ProACT – An European funded project to use technologies to improve home healthcare

ProACT (Integrated Technology Systems for ProACTIVE Patient Centred Care) is an EU-funded Horizon 2020 project. ProACT targets Europe's 50 million multimorbid patients to proactively self-manage and offset the EU's annual €700 billion cost of chronic disease management. ProACT aims to develop and evaluate an ecosystem to integrate a wide variety of new and existing technologies to improve and advance home-based integrated care for older adults with multimorbidity, including associated co-morbidities. The aim of the project is improving patient engagement, improving workflow management, advancing home-based healthcare and use of ICT and advancing new healthcare models.

The ecosystem will connect four key care and support models central to understanding and implementing effective, continued and coordinated patient centric care (including self-management);

- Homecare (including informal care);
- Hospital care;
- Community and social care; and
- Social support networks.

Trial sites in Ireland and Belgium are using Living Lab facilities to ensure co-design of ProACT technologies, and implement proof of concept trials involving national health services, 120 patients and their formal and informal care networks. The project is deployed for the following conditions: chronic heart failure (CHF), coronary heart disease (CHD), diabetes and chronic obstructive pulmonary disease (COPD).



Example of homecare monitoring

The Irish trial site is led by NetwellCASALA in DIT (supported by Trinity College Dublin) and involves 60 patients spread across north-east region of Ireland, in counties Louth and Dublin. ProACT works primarily with a public healthcare institution, the Louth Hospital. To take part in the trial, the patients have to be over 65 years and have two or more of the chronic health conditions referred to above. First results of the trial will be published in June 2019. The patients are supplied with an iPad, which includes the ProAct app. Key health data is recorded and monitored remotely. The app also answers questions and has an educational tools for the patients conditions. The system then highlights any issues. There is a triage service in CareDoc in Carlow to manage any patient issues or concerns.

"The main benefits identified so far in the project are patients being empowered to manage their own health; increased confidence that the patients are well, it gives them peace of mind. Similarly, as all the data can be shared with consultants saving time and recording trends over time that assist in managing the health conditions".

"It is also important to share data with the patients care network i.e children, GPs etc".

Interview with Dr. Julie Doyle, Principal Investigator ProACT project, NetwellCASALA, Dundalk Institute of Technology.

"Monitoring health remotely can have positive benefits for patients as well as the overall health budget"

Dr. Julie Doyle

Health – Irish Case Studies

Case Study 5 – University Hospital Galway

CASE STUDY UNIVERSITY HOSPITAL GALWAY

- University Hospital Galway's Acute Medical Unit (AMU) and Short Stay Ward uses Digital Progress Notes and Order Pathways to save clinicians time, standardise care delivery, and provide valuable data for Activity-Based Funding reporting.
- The objective of the AMU is to fast-track the assessment of patients presenting with acute medical problems and to facilitate early diagnosis and treatment.
- The existing processes within the AMU relied on non-standardised paper-based methods. This was time consuming and led to longer periods for diagnoses and initiation of treatments.
- The AMU partnered with Think Research to deploy their cloud-based platform Entrypoint, which helps improve workflows and support the clinical.
- The consensus was that clinicians were working faster and smarter, and able to spend more time with patients and decision-making process.

Case Study 6 – Discharge Management

(GPI) Discharge Management: Safer Discharges and Improved Information Transfer Metrics



- The aim of this project was to improve medication safety at the point of hospital discharge by using targeted medication reconciliation and producing a computer-generated prescription. This new model for discharge prescribing was introduced for patients who met both of the following criteria in two acute hospitals:
 - Prescribed 9 or more medications, at the time of admission; and
 - Aged 70 years and over.
- Published research had demonstrated that 50% of discharge prescriptions were non-reconciled. A recent study demonstrated that 43% of patients experienced post-discharge medication errors. The prevalence of polypharmacy (>5 medications) has increased over the 15 years to 2012, from 17.8% to 60.4% in people 65 years and older in Ireland.
- The new model for discharge prescribing used collaborative medication reconciliation and the e-Discharge software to improve the quality of discharge prescriptions. The model was introduced in both hospital sites and received support from community and hospital colleagues. Clinical pharmacists became the project champions and worked closely with medics during the change process. Key safety aspects of the new model were:
 - Clinical double check for this high-risk process - the pharmacist and the doctor sign the prescription
 - Increased legibility
 - Explanation for all prescription changes to GPs and Community Pharmacy colleagues

9. *Entertainment*



Entertainment

The need for high speed broadband services is apparent in order to access online entertainment, given the requirement for fast download speeds in order to avail of online streaming and gaming services.

PwC analysis has identified annual growth in over-the-top (OTT) content streaming of 9.8% for the period 2018-2022 while scheduled television services are only forecast to grow by 1.4% per annum over the same period. The movement from scheduled-TV to online allows for greater flexibility. For example, users can stream and watch online content at their leisure without the need to wait for scheduled-TV. As of June 2018, Netflix has 70 million subscribers worldwide and an estimated 200,000 in Ireland, having gained rapidly on Sky's 500,000 user base here.



*Improving **Internet infrastructure** and better **online features** in newer **gaming consoles** are driving the digitisation of the market, trends which will continue thanks to new hardware releases such as the PS4 (the “Pro model”) and Nintendo’s new semi-portable model ‘Switch’.*

Irish Entertainment & Media Outlook 2018 – 2022, PwC Ireland

Sky has identified the demand for streaming and access on demand and has unveiled its partnership with Netflix to offer an entertainment bundle to its customers. Sky has announced that it is making Netflix available to new and existing customers through a brand-new ‘entertainment TV pack’ called Sky Q, which incentivises customers to avail of Sky’s television services. Add-ons to the package include music streaming service, Spotify, which allows users to play music through their TV device.

The high cost of streaming video and audio content through 4G providers means that customers are largely dependent on broadband services in order to avail of streaming entertainment at home.



***Over-the-Top content** consists of the delivery of **audio, film and TV** content **via the internet**, without requiring users to subscribe to a traditional cabled or satellite TV service. OTT video **popularity is set to continue rising** as viewership shifts from traditional TV programming to online video, particularly among younger demographics – e.g. Netflix, Amazon Prime Video.*

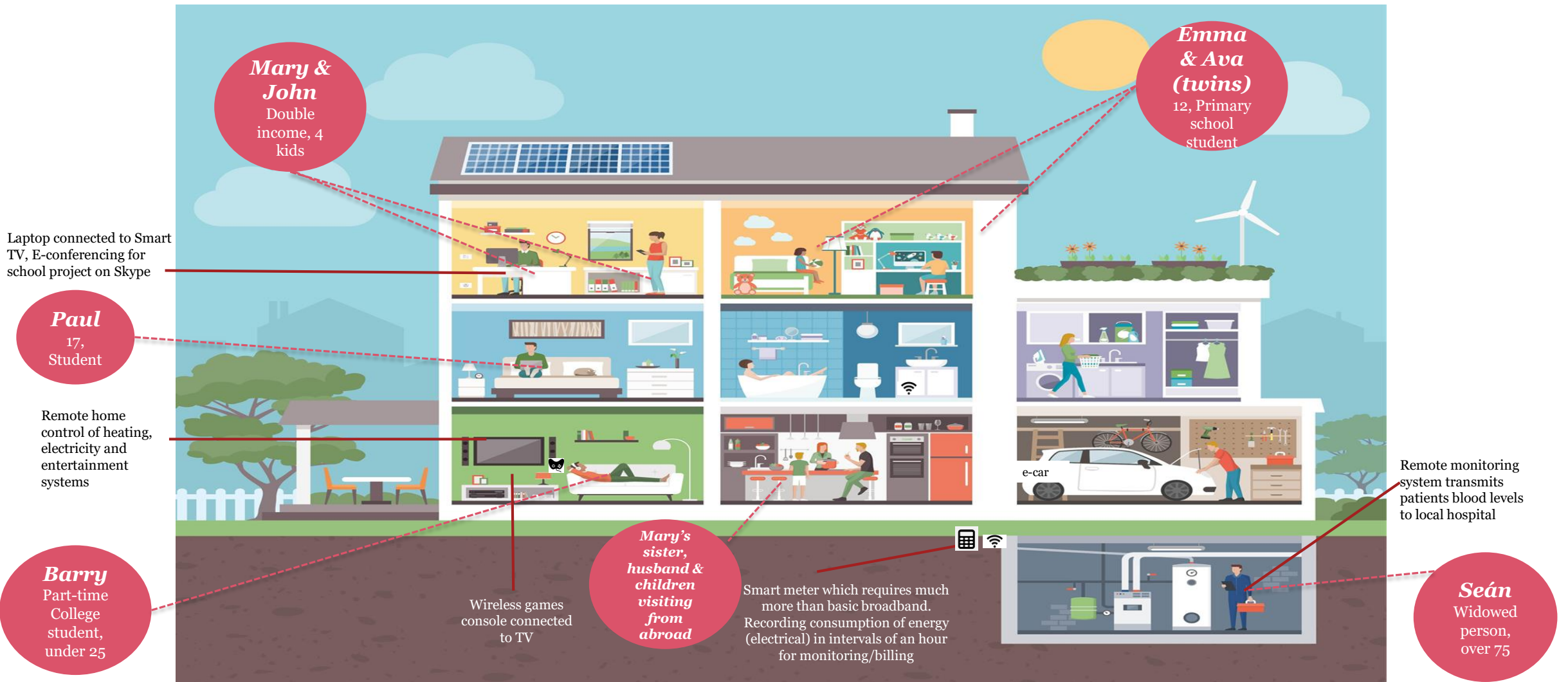
Irish Entertainment & Media Outlook 2018 – 2022, PwC Ireland

10. Other

The consumer view of the future of the smart home...

Smart Home - The Connected Rural Family

(The O'Brien's, Hacketstown Carlow, Thursday Afternoon, February 2022)



Source: PwC

Private & Confidential

Profiles of selected O'Brien family members



Mary is married to John and living in Hacketstown. She is an IT recruitment specialist and works remotely to her Dublin based firm three days per week.

With NBP

Mary uses cloud computing, drop box and teleconferencing extensively for her work. Reflecting constraints in the domestic IT labour market, many preliminary interviews are conducted with candidates overseas. Without the NBP, Mary could not have left Dublin where a long commute and cramped living conditions were constraining her life quality. This was compounded by a growing concern for her elderly father who was increasingly lonely in his farmhouse and in declining health. While she misses aspects of Dublin life, she can keep in touch with friends using social media and is a member of online Yoga and Pilates teaching groups.

Mary is budget conscious and has realised significant household savings through the clever use of smart technologies.

No NBP

Mary is living in Dublin, working remotely on an occasional basis. Weekend visits to her Dad are becoming an increasing drain on her time and she thinks the time might be right for institutional care. He wouldn't dream of living in Dublin. The housing situation in Dublin is at crisis point and there is no prospect of securing better accommodation for the family whose space needs are expanding rapidly.



Primary school student. Home from school on a Wednesday with the Chickenpox. She is feeling well but cannot attend school because of contagion risks.

With NBP

Emma is being minded today from home by mum, Mary. High speed broadband in the home meant that Mary can do a full day's work and still take care of Emma. Online educational materials and the ability to use multiple online devices simultaneously in the home means Emma can stay on top of her school work even when she is absent.

No NBP

Mary works remotely from her Dublin home and minds Emma. Reflecting national broadband constraints, online education materials are fairly limited and Emma can only access these when Mum is taking a break.

Profiles of selected O'Brien family members



Barry, qualified engineer.

Part-time college student and teaching assistant aged 25 years.

With NBP

Barry spent four years studying engineering in UCD but to the recent dismay of his parents cannot find employment. There are very limited family funds for another degree programme so Barry is undertaking an online programme to become a qualified teacher while living from home and undertaking part-time teaching hours to fund his lifestyle. He can access all of the teaching materials, attend online tutorials and video conferences with project team members from the comfort of his home.

No NBP

Broadband restrictions means that remote participation in the primary school training programme is much more challenging, requiring Barry to commute to Dublin and pay higher fees in an alternative training college. The scope for part-time working is significantly reduced and the quality of education received is less than with that which is online enabled.



Seán is a widower of 75 years. Suffering from chronic heart failure, Seán has lived just outside Hacketstown in Co Carlow all of his life. He no longer drives but still enjoys the company of family and friends.

With NBP

Seán's eldest daughter, Mary, moved back to Hacketstown in 2020 seeking a better quality of life for her family after 15 years in Dublin. His two other children live away. As a result of her move home, Sean has avoided the need for institutional care and lives in a small annex to the main family home. While at a significant remove from heart specialists in the Mater Private, which he attends, Sean's heart condition is managed expertly through an ehealth solution. His rate of admission to hospital has decreased radically and his general quality of life has improved as a result of greater access to expert knowledge. He also has remote access to an integrated team of primary healthcare specialists in Carlow. He keeps in touch with his other adult children through video technologies provided to him by his daughter Mary.

No NBP

With no family living close to home Sean moves prematurely to institutional care for the elderly. He has no access to the technologies which he would need to stay in regular touch with his family. His daughter Mary is very busy but manages to come from Dublin every two weeks with the grandchildren. It's a visit he very much looks forward to. Sean's health is failing and he has three admissions to hospital this year. He has a regard for his local care team but has doubts regarding their understanding of his condition.

Smart technologies

As we move into the next era in technological advancements, we will see more developments in relation to smart homes and cities. This will see technology play a major role in advancing most areas of our everyday lives. These advancements will provide greater connectedness across communities but will be dependant on reliable fast speed broadband access to truly embed smart technologies in Irish society.

'Smart' technology examples:

Cloud and big data

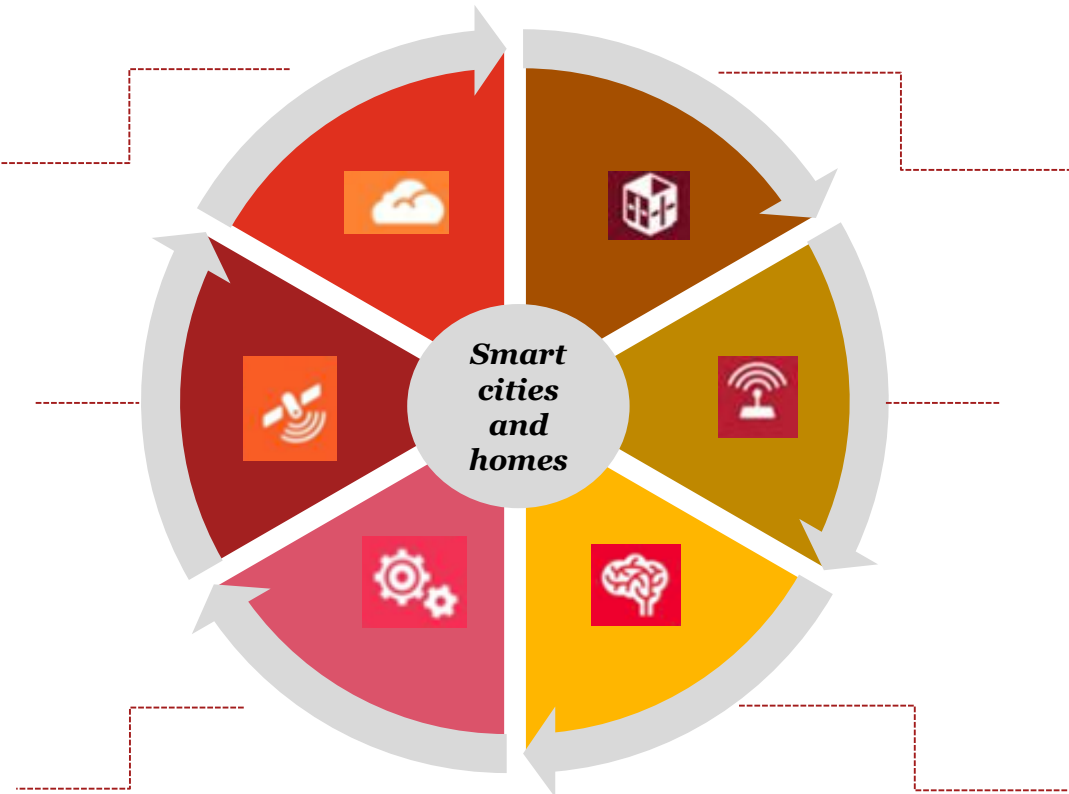
- Cloud computing homes heating
- Cloud based appliance control
- Building Information Modelling
- Digital planning processes

Autonomous vehicles

- Mobility-on-demand services
- Open-sourced driver assistance programmes
- App based autonomous vehicle networks
- Drones for real-time traffic data

Advance materials

- Efficient concrete
- Solar sprays
- Heat reduced sprays
- Super insulating and acoustic materials



3D printing

- Solar sprays for vehicles and buildings
- Printed buildings











Internet of Things

- Smart building systems to include heating, lighting and hot water
- Smart urban mobility, energy, water, waste systems

Artificial Intelligence

- Auditory-cue responsive lighting and heating
- Optimised sustainable building designs

Smart Homes

 <p>Smoke/CO2 sensor</p> <p>Sounds alarm including outdoor siren. Turns off gas in case of fire. Switches on lights if smoke alarm activated at night</p>	 <p>Water leak detection</p> <p>Shuts off stop cock if there is a water leak or flood and alerts owner, could link to insurance</p>	 <p>Shutters/curtain controllers</p> <p>Shutters and curtains automatically open and close based on light level</p>	 <p>External thermometer</p> <p>Measures external temperatures and adjusts internal temperature accordingly. Warns of ice risk on footpaths and road</p>	 <p>Cameras</p> <p>Check if/when children reach home, whether pets are OK</p>
 <p>Door and window contacts</p> <p>Alert householder if window left open when property empty. Digital door lock enables remote control, allowing care workers or tradesmen entry when not at home. Intruder alarm, link to insurance company reducing premiums for good security</p>	 <p>Radiator thermostats</p> <p>Switch off heating when room unused. Maintain pre-set ambient temperature. Activate heating if outdoor temperature falls below 5° centigrade</p>	 <p>Motion sensors</p> <p>Switch lights on and off. Check elderly relatives have got up. Intruder alarm; connect to monitoring services or community organisations</p>	 <p>Appliance control</p> <p>Connect to smart grid so that devices operate when energy is cheapest. Non-essential appliances not left on when occupants are out. Energy company can offer more flexible tariff</p>	 <p>Home entertainment</p> <p>Early warning of component failure. Manufacturers improve development of products and services by learning how devices are used. Customers offered usage-based insurance. Music played around the home, linked to wearables</p>

Conclusions

Conclusions

While the NBP will have a positive impact across a wide range of areas, those areas likely to benefit significantly include:

- a. Education: Digital resources are becoming more part of the day-to-day education system. Using technology can benefit children in the school and at home but children will require access to broadband in the home to fully avail of resources.
- b. Social Inclusion: NGA broadband can significantly contribute to social inclusion for all, and to rural development. Social media provides the ability to ‘stay-in-touch’ with people no matter the time-zone or geography. Other areas of benefit include security, access to online platforms such as online banking and eGovernment tools.
- c. Enterprise: Access to reliable broadband services can support net job creation through the growth of existing enterprises and the formation of start-ups in areas that previously did not have access to high speed broadband.
- d. Health: Broadband will contribute to advances in technology and infrastructure which can increase efficiencies in making decisions across the healthcare landscape, as well as contribute to professional education and training in all healthcare settings; urban and rural.
- e. Tourism: A lot of Ireland’s great tourist attractions are situated within the IA and would benefit from having access to NGA broadband services. This access will support the growth of SME businesses in promoting and attracting visitors from around Ireland and abroad.
- f. Agriculture: Agricultural benefits can be realised in the future by the adaptation of Smart farming methods. These methods can improve productivity, improve herd nutrition, allow for data-driven crop management, as well as reduce adverse environmental footprint.

Delivering the NBP is key to the successful implementation of existing government strategies to develop Ireland i.e. National Development Plan, Ireland 2040, Action Plan for Jobs and Rural Regeneration. It is also vital to deliver high speed broadband to rural Ireland to encourage its renewal and growth and to alleviate the frustration experienced by those in areas who have been waiting for delivery of this essential service.

The NBP has the commitment of all stakeholders to deliver a stable network to all, which will place Ireland at the forefront of the digital economy.

In summary, it is clear that the roll out of the National Broadband Plan (NBP) will deliver benefits beyond those that can be considered quantifiable at this point and will have transformative effects across all of Ireland’s sectors. Together these benefits will have a wide and lasting impact on families, communities, businesses, as well as the broader societal benefits through greater social inclusion and rural development.